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INVESTIGATION OF ATTRIBUTION OF CAUSE,
EXPOSURE FACTORS AND
PSYCHOSOCIAL STRESS PARAMETERS
AS THEY RELATE TO
MUSCULOSKELETAL COMPLAINTS
IN KEYBOARD OPERATORS

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ABSTRACT

The present study was designed to explore a number of issues associated with musculoskeletal complaints and would appear to be the first to compare keyboard operators and their authors on their perceptions of the work environment and their attributions of causal influences on RSI. Another original aspect of this study is the analysis, within a single study, of multiple variables, most of which have previously only been investigated individually.

In addition, several hypotheses were developed and tested to identify the nature of stress which, although generally presumed to be critical in the development of RSI, and more general work-related musculoskeletal symptoms, do not seem to have been explored in any detail. Perceptions of the working environment were also compared between RSI sufferers and nonsufferers.

A sample of 144 keyboard operators and 79 authors was used to test relevant hypotheses and research questions. Of the keyboard operators, 17 (14.8%) had been diagnosed by their doctor as having RSI, 107 had symptoms of RSI but were not diagnosed and 20 were non-sufferers.

The findings support the view generally held, that the origin of RSI is multicausal. Factors at all levels - biomechanical, individual, organizational and social - were shown to have significant associations with musculoskeletal complaints, and RSI in particular.

In addition, the study shows that stress is clearly a predictor of RSI and some of its components were identified. An important element of such stress was related to the interaction between keyboard operators and authors. Discrepancies between authors and operators were found in their perception of both the work environment and their opinions of the causes of RSI. Authors viewed operators' work environment significantly more positively than operators did, although authors were somewhat dissatisfied with what operators produced. Both groups also tended to attribute causal influence to the personal characteristics of the other group, and to abrogate their own responsibility.

The study indicates that measures introduced to prevent RSI should take work-related stress factors into account, particularly the interaction between keyboard operators and their authors. Suggestions are also made for ways in which keyboard operators may reduce their likelihood of developing musculoskeletal complaints.

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CHAPTER 1

INTRODUCTION

Repetition Strain Injury (RSI) is an occupational health issue that has generated much controversy and confusion in Australia. Its rising incidence during the 1980s, particularly among keyboard workers, has caused considerable concern throughout the community and attracted wide publicity. The significance of this problem as a major occupational health issue is reflected in the fact that it is one of two topics given top priority for investigation by the National Occupational Health and Safety Commission (NOHSC, 1985).

Despite the considerable difficulties involved in attempting to define RSI (discussed in an earlier literature review, Wall, unpublished), the definition recommended by NOHSC will be adopted for the context of this thesis. The committee defines RSI as:

a soft tissue disorder caused by the overloading of particular muscle groups from repetitive use or maintenance of constrained postures. It occurs among workers performing tasks involving either frequent repetitive movement of the limbs or the maintenance of fixed postures for prolonged periods. (NOHSC, 1985, p. 8)

Researchers in each country in which studies of this type of complaint have been carried out use their own terms. For example, in Scandinavia the term musculoskeletal injury is used. Japanese researchers refer to Occupational Cervicobrachial Disorder and in the United States, carpal tunnel syndrome is

referred to. For the purpose of this study such terms are considered interchangeable, including the terms more familiar in Australia such as tenosynovitis and RSI.

Within the community there is a wide spectrum of views on RSI. These views range from doubts about the authenticity of the condition to concern about losses in productivity, rising workers' compensation costs and the suffering experienced by a growing number of individual workers.

In recognition of the influence widely-held attitudes have on strategies for prevention and management of work-related health and safety issues, there is a clear need to examine the perception of RSI, the work environment and in particular the causes of RSI among various key groups. The National Occupational Health and Safety Commission (NOHSC) has recognized that the lack of awareness of the condition in work places has created an often hostile and rejecting environment for those suffering from RSI. However such perceptions have not been studied in any depth.

Furthermore, despite a plethora of speculation and anecdotal evidence, very little substantive research has taken place to identify risk factors, particularly the investigation of multiple factors within a single sample.

An additional deficiency in the literature is the lack of specification of stress. Although considered premonitory, it remains undefined and unspecified.

This study was specifically designed to address some of the apparent major deficiencies in the literature, exploring previously determined exposure factors and as yet unspecified parameters relating to exposure within a single study. Relationships between multiple psychosocial factors and the occurrence of RSI and related problems are to be examined. In addition, the influence of attitudes and perceptions on strategies for prevention and management of work-related health and safety issues are examined. Recognized by NOHSC as important, the nature of perceptions of causes of RSI and of the work environment were examined and compared across the two populations most directly involved with keyboard work practice - keyboard operators and those who determine their work, referred to here as the authors. An important methodological aspect of this study is that both sufferers and non sufferers will be examined within the same work environment.

Because there is so little substantive research in the area which this thesis seeks to examine, this research project is essentially and necessarily both descriptive and exploratory. It is oriented toward testing general explanations for the apparent differences in the incidence of RSI as a musculoskeletal problem in keyboard operators as well as exploring the differing perceptions of the causes of RSI amongst those affected both directly and indirectly by the condition. In addition to attribution of cause, perceptions of general work environment issues and exposure factors are also examined in terms of their relationship with injury occurrence. Thus

factors previously researched within single studies and many issues of importance, and as yet not researched, have been explored within a single study.

Due to the absence of literature referring to operators' and authors' perceptions of the work environment and RSI, the literature related to stress in the work environment and exposure (risk) factors associated with RSI will be reviewed.

From the narrow focus on clearly identifiable hardware conditions, most of the literature recognizes the multicausal nature of RSI. In addition to recognition of the multicausal nature of the problem, many authors are placing an increasing emphasis of the role of stress, though none have clearly identified its components. Examination of the literature reveals two levels of focus. The first emphasises exposure (risk) factors (e.g., hardware, workplace, physiological 'fit'). The second focus, based primarily on speculation (e.g., McPhee, 1982) is on the parameters that relate to exposure. These parameters include perceptions of the work environment and personal characteristics which to a large extent determine the experience of psychological stress. Such parameters can more readily accommodate explanations of injury where no 'exposure' is identifiable (e.g., no changed working pattern or changed equipment but a lack of feedback and unrealistic expectations exists).

A MODEL INTEGRATING THE HYPOTHESES ABOUT STRESS AND RSI

To facilitate conceptualization of these complex relationships involved with stress and RSI, a model has been developed to provide a context for each section of this study.

While there is general agreement on the importance of physical and emotional stress in RSI, there is essentially a division of medical and other opinions in terms of the nature of the relevancy of stress. The RSI Task Force Report on "RSI in the Australian Public Service" (1985) identified what they viewed as a continuum rather than a dichotomy of opinion on the role of stress in the development of injury and/or pain.

At one end are those (e.g., Mitchell, 1984; Broadbent, 1981; Kuorinka, 1981; Smith, 1981) who believe physical and/or emotional stress lead to physical tension which results in organic injury (which may or may not be identifiable). At the other end are those (e.g., Lucire, 1985; Wisner, 1981) who consider physical and/or emotional stress as neurotic or as being 'converted' to be expressed as a physical symptom in the form of real functional pain, but in the absence of organic injury.

Figure 1 illustrates how psychosocial parameters relate to both explanations of the role of stress in the development of RSI. Examination of the psychosocial parameters thereby has greater explanatory potential than limiting the focus to exposure factors alone.

Figure 1

Psychosocial parameters as they relate to the explanations of the role of stress in injury

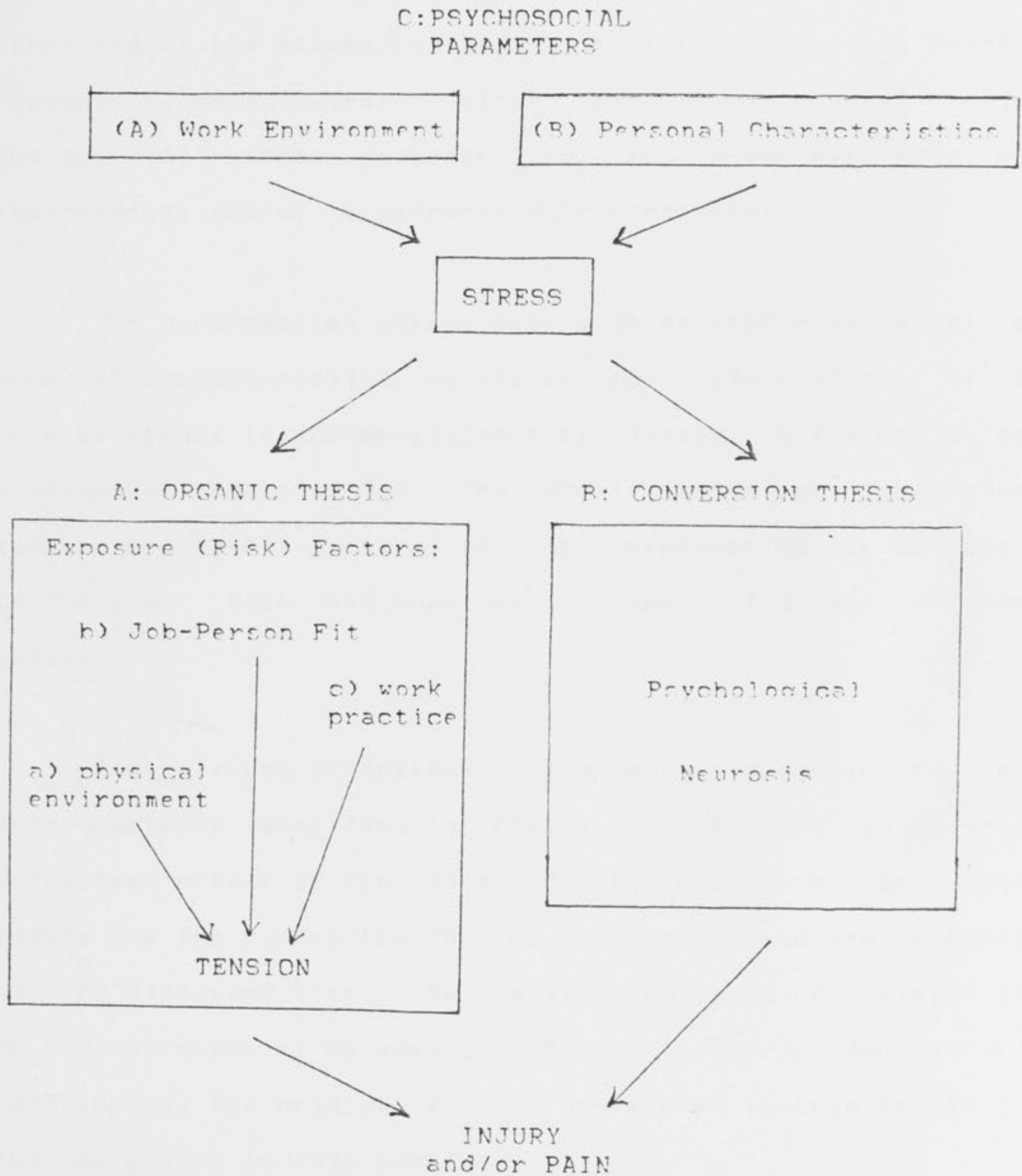


Figure 1 illustrates how psychosocial parameters relate to both explanations of stress which result in injury. The Organic Thesis focuses on the role of exposure (risk) factors which may precipitate physiological tension leading to injury. At the other end of the stress continuum is the Conversion Reaction Hypothesis which views injury as a functional (i.e., non-organic) stress response to an unsatisfactory work environment, and/or to personal characteristics.

The psychosocial parameters, such as work environment and personal characteristics, relate to both explanations of the role of stress in the development of injury, offering a more fundamental understanding. Thus the influences on (parameters) and the end result (injury) of either explanation can be viewed as the same. Both explanations may be valid for different people.

The relevant literature will be examined within the three major contexts identified in Figure 1. As the psychosocial parameters relate to the stress identified by both the organic thesis and the conversion thesis, each thesis and its components will be discussed first. This will be followed by elaboration on the psychosocial parameters relating to stress identified by both theses. The original material presented in this thesis can then be placed in this context.

B : ORGANIC EXPLANATION OF THE ROLE OF STRESS IN THE DEVELOPMENT OF RSI

Proposed explanations of the physiological mechanisms of injury

Explanations of the physiological mechanisms by which injury and/or pain occur are still a matter of debate. Two foci predominate. The first explanation relates to the nature of the activity, i.e., the number of movements of the muscles (overuse) causing (a) inflammation and exhaustion of the supply of synovial fluid to the tendons (Walker, 1979, p 19), or (b) frictional heat from so much activity which breaks down the synovial fluid producing a toxic inflammatory by-product (Walker, 1979). The second major hypothesis more generally explains the condition as a result of muscle tension. The tense and contracted muscles reduce blood flow. Muscles thereby are less able to meet their energy requirements and eliminate the metabolites like lactic acid and ammonia. If this persists for a long enough time period it leads to substantial biochemical disturbance and on electron microscopy, visible damage to the cellular structures (Mitchell, 1984, p. 3).

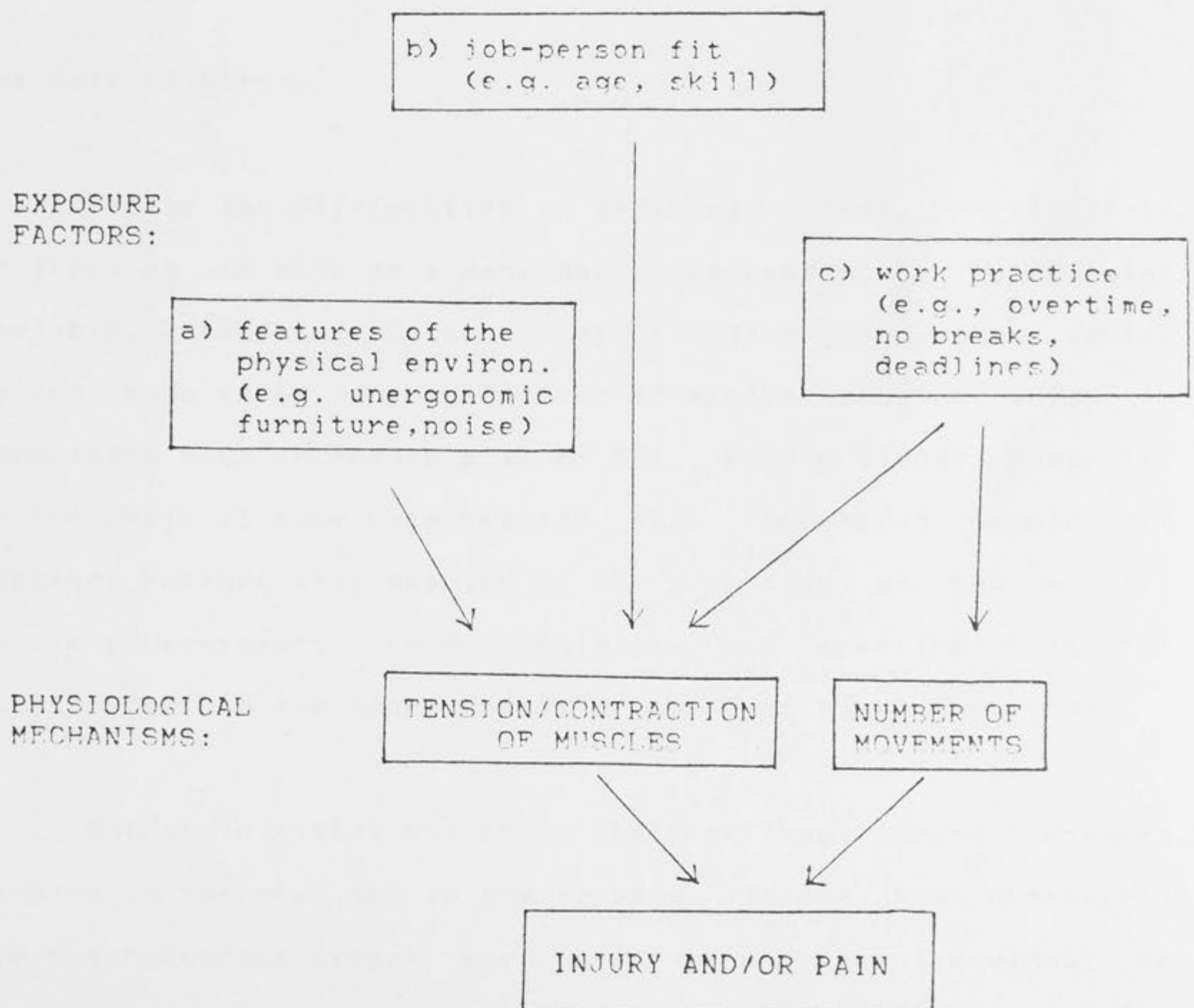
Exposure factors

When these hypotheses about the physiological mechanisms are viewed in the context of known exposure factors, both mechanisms could be considered appropriate explanations.

Figure 2 illustrates how exposure factors relate to the physiological mechanisms that may lead to injury and/or pain.

Figure 2

Relationship between stress, in terms of exposure factors, and the physiological mechanisms of injury and/or pain



Although most factors that would influence the number of movements would also bring about contraction and/or tension of muscles, many factors predisposing the operators to tense muscles will not be related to overuse (e.g., deadlines may cause fast keying and tension (static load), though biomechanical tension resulting from uncomfortable furniture is probably unrelated to the number of movements carried out and may in fact reduce them).

The Role of Stress

Despite the difficulties in defining stress, particularly in terms of its role as a dependent, independent or intervening variable, Browne and his co-workers (1984) contend that mental stress leads to an increased level of muscle tension which is associated with increased risk of RSI. Patkin (1984) suggests, on the basis of nine case reports that "unrelaxed people may contract antagonistic muscles at the same time as the primary muscle of movement, like driving a car and pressing both the accelerator and the brake pedals at the same time". (p. 289).

Goldstein (1964) has shown that emotional stress increases tension in the neck and in the forearm flexors and extensors. The psychological stress may often cause the individual to increase speed of keying, become more forceful in movements and

less aware of posture, muscle tension and the need to break (Patkin, 1984).

Mental stress has been seen as a major contributing factor to RSI by Ohara and others (1976) and Ryan and his co-workers (1984). Ohara's study of cash register operators led him to conclude that mental stress was one of four major factors involved in musculoskeletal problems. Ryan's work on Data Processing Officers found that feelings of pressure, in combination with three other factors best predicted lower arm symptoms and in combination with four other factors, was associated with shoulder/neck problems.

The following section reviews in brief the literature relating to these exposure variables. It must be kept in mind however that a major proportion of the extant literature on RSI is speculative and anecdotal. Some authors have written general papers based on their experience or observations, suggesting a range of associated factors. Others evaluated many factors and identified several which they considered to be the main contributing factors. Only a few authors have conducted specific research studies to evaluate whether or not certain factors are associated with RSI, and it has been rare that any have attempted to measure the relative importance of an array of factors. The basis of evidence on which conclusions are presented thus varies widely. On the whole, the information provides useful suggestions of influence, but empirical data is lacking.

Table 1 outlines in summary some of the major findings of researchers investigating factors associated with musculoskeletal problems.

Table 1

Summary Table of Research Studies
Identifying factors associated
with the development of RSI

YEAR	AUTHOR	SAMPLE	MAJOR FINDING
1951	Ferguson (Australia)	516 Telegraphists	a) Neurosis
1971	Ferguson (Australia)	71 Process Workers	a) Work overload b) Equipment and job design
1979	Taylor, Gow Corbett (Australia)	89 Process Workers	a) Increased work rate b) Poor ergonomic design
1980	Coe (N.Z.)	257 VDT operators 124 controls	a) Type of work activity
1980	Maeda Hunting Grandjean (Switzerland)	119 Accounting Machine Operators	a) Repetitive movts. b) Posture
1981	Cannon Bernacki Walter (U.S.A.)	30 Patients with carpal tunnel and 90 controls	a) History of gynecological surgery
1981	Stammerjohn (U.S.A.)	125 Professionals & 129 Clerical VDT Operators 157 Non-operators	a) Job specific differences b) Stress
1981	Sauter (U.S.A.)	250 VDT operators 84 non-operators	a) Stress

YEAR	AUTHOR	SAMPLE	MAJOR FINDING
1982	Cumpston (Australia)	108 Data Process- ing Officers (DPO)	a) Keying rate
1982	Grandjean (Switzerld)	68 Visual Display Terminal Operators	a) Subjective comfort
1983	Brown (Australia)	74 Health Centre Clients (Process workers, typists, DPOs)	a) Increased workload A) Repetiton activity
1983	Kvarnstrom (Sweden)	11,000 health records of Industrial Workers	a) Older age b) Shift work c) Monotonous and stressful work
1983	Western Region Health Ctr. (Australia)	82 Clinic Clients	a) Workload b) Working overtime
1984	Bjorksten (Sweden)	100 Medical Secretaries	a) poor ergonomic design of workstation b) lack task variation c) insufficient rest breaks
1984	South Aust. Health Commission	466 Data Entry and Word Proces- sor Operators	a) Time at keyboard b) Ergonomic factors c) High workload
1984	Mills and Sallans (Australia)	470 Visual Display Operators	a) Lack of training b) Working for extended periods without a break c) Work load
1984	Oxenburgh (Australia)	46 Injured Word Processing Officers	a) Work load (more than 5 hours a day)

YEAR	AUTHOR	SAMPLE	MAJOR FINDING
1984	Ryan Mullerworth Pimble (Australia)	52 Data Processing Officers (DPO)	a) Age b) Length of time spent keying c) Keystroke rate d) Feelings of pressure
1984	Taylor Pitcher (Australia)	122 DPOs	a) Ergonomic factors b) High work rates

a) Features of the physical environment

Until recently, much of the attention given to musculoskeletal problems associated with keyboard work in Australia has been narrowly focused on the causal influence of hardware (chairs, desks, keyboards, etc.). Some of the more clearly identifiable physical environment exposure (risk) factors suggested in the literature to relate to RSI are identified below. However, as mentioned repeatedly, a significant proportion of the literature is unresearched, and research that has been done is often methodologically unsatisfactory for adequate generalizations to be made, particularly within the context of a single work environment.

Equipment: Poor design of equipment, work place and workspace have been cited as contributing factors to RSI in a range of papers on RSI (Browne et al., 1984; Caple, 1983; Felmingham, 1983; NOHSC, 1985; Stone, 1984). As a result of

their studies of medical secretaries and Data Processing Officers, Bjorksten (1984) and Taylor and Pitcher (1984) both named poor ergonomic design as a major factor in the development of RSI symptoms.

Changes in equipment, reflecting technological advances, have been suggested as potentially producing problems in that they require simple repetitive tasks, or a more concentrated way of working in terms of speed and work density (Ohara et al., 1976).

In his 1971 report on telegraphist's cramp, a condition which would now be categorised as RSI, Ferguson found a significant relationship between the condition and an adverse attitude to seating and equipment.

Other physical features: Other features of the physical environment which have been suggested as possible contributing factors to RSI are adverse degrees of heat, cold, humidity, light, lack of oxygen and cramped space. Ohara and others (1976) identified an unfavourable working environment as one of four major factors associated with musculoskeletal problems in Japanese cash register operators.

Such physical working conditions may play a role in job tension which is typically not a primary, but rather an additive influence. The main impact of physical stressors has been shown to be the lowering of worker tolerance to other stressors. Excessive noise, poor ventilation, lack of space, and inadequate

lighting can produce both physical and attitudinal problems (Caplan et al., 1975; Smith et al., 1978, Smith, 1981). Temperature has also been suggested to have a significant influence as a physiological stressor resulting in injury. Weald (1984) reports that when the temperature of the working environment had been raised to about 24 degrees centigrade, there was an overall reduction in RSI complaints. Heat and humidity may also induce drowsiness, distress or discomfort and organic tension as manifest in back and neck pains, and headaches (Cakir, 1980; Grandjean, 1981).

Although poor design of equipment, workplace and workspace have been cited as contributing factors to RSI, such factors are generally recognized to be only part of the problem. As Maeda (1983) and many others (e.g., Gunzberg, 1983; Oxenberg, 1984; Rawlings, 1984; Ryan, 1984) have pointed out, placement of ergonomic devices in environments that are badly organised and rife with job dissatisfaction is a recipe for ultimate failure. A number of studies have looked at this in detail, for example, Oxenburgh's study of 46 keyboard operators with RSI and a control group of uninjured clerical and secretarial staff in a large Australian company, concluded that inadequate workstation design was not a primary causative factor of RSI. There was no difference in workstation design between the injured and uninjured groups in his study. Similarly, Berqvist's extensive review of the literature for the Nordic Council of Ministers (1984) concluded with the statement that "psychosomatic disorders (muscular or "psychic" tension) appear to be more linked with the job design and psychosocial stressors in the job

than with the use of the equipment per se" (p. 22). Sauter also pointed out (1983) that keyboard use itself was not a stressor; rather where keyboard use is associated with degraded working conditions, the stress would be the same for non-users working under similarly degraded conditions.

b) Job-Person Fit

While physical and work history characteristics of the worker have been suggested as contributing factors to RSI by several writers, actual empirical research studies are few except in the area of worker skill and experience. These factors are seen by some to be relatively unimportant compared to occupational factors (Felmingham, 1983).

Fitness: Although the importance of general fitness in guarding against RSI has been suggested, though not tested, by McPhee (1980) and Browne and his co-workers (1984), the only evidence in the literature associated with fitness (degree of excess weight), was not found to be associated with musculoskeletal injuries by Denehy (1978) and Luopajarvi and her associates (1984). Such a measure does not however, seem particularly illustrative nor adequate as an indicator of fitness, particularly in terms of vascular health (circulation) which is an important aspect of the organic explanations of injury.

Associated physical symptoms: From a medical viewpoint, a paper on tenosynovitis by Simpson (1980) listed a range of factors which may physically predispose an individual to develop the condition, including a past history of injury and arthritis. These factors have not however been investigated in empirical research.

Competency/skill in task: Less tangible person-job fit characteristics are aptitude, skill, training and practice in the task have been suggested by McPhee (1980) as associated factors in the development of musculoskeletal problems. Lack of training in the use of equipment (Browne et al., 1984) and skill training in process work (Caple, 1983) have also been suggested as contributing factors to RSI. A working document reviewing workplace-based studies in Australia, (NOHSC, 1985) noted that most workers (blue collar and white collar) reported lack of training in use of equipment and their workplace area.

Age: Age and its physiological correlates has been another characteristic identified as a possible factor influencing job-person fit which may predispose an individual to injury. McPhee (1980) has suggested that minor strains over a number of years may lead to musculoskeletal problems in middle aged workers who had not previously had problems. Age, she suggests, also affects the ability to tolerate noise, heat or other stressors in the working environment. However, the research evidence on the effects of age is inconclusive. In their observations of RSI in factory workers, both Caple (1983) and Denehy (1978)

found no age-related patterns. Luopajarvi and her co-workers (1984) found no association between age and neck tension in their examination of personal factors in the development of neck symptoms. Hayashi and others (1983) found a negative correlation between age and trunk and neck problems in key operators, indicating that younger workers may be more prone to this disorder than older operators. The only evidence reviewed which points to increasing problems with age was a finding by Ryan and others (1984) that lower arm symptoms were correlated with age at a level close to statistical significance.

An apparently better predictor of physiological fit with the job is the overall period employed in the high risk occupation.

Years spent keying: Years in the same kind of repetitive work has been found to be a significant factor in the development of occupational cervicobrachial disorder (Maeda et al., 1982; Hayashi et al., 1983; Ryan et al., 1984; Suzuki, 1973). Hayashi found significant correlations between working period as a keyboard operator and symptoms in fingers and hands and arms. Suzuki (1973) concluded that the location of the condition differed according to years of service. Arm/hand disorders were apt to develop after short-term service (six to twelve months) and neck/shoulder problems after 'long term' service of two to three years.

Accustomization: Also related to job-person fit is how well accustomed the operator is to the work because of 'newness' to the job or because of absence. Howard (1938, p 724), an American surgeon, noted that "a long 'lay-off' from a particular job can be followed by ... peritendinitis crepitans in a certain muscle group when the re-employment involves use a high speed over a long period of time". Thompson and his co-workers (1951) make a similar point on the basis of a literature review of peritendinitis crepitans and simple tenosynovitis; the effects of speed and intensity of muscle effort are greater in fresh workers or veteran employees returning to work after a period of absence.

c) Work practice factors

These mental stress issues can also be related to specific work practice factors associated in the literature with stress and RSI.

Quantity of work: Pressure to complete a large workload within specified time limits can lead to considerable mental stress (Caple, 1983; Maeda, et al., 1982; Taylor and Pitcher, 1984), particularly when there is a discrepancy between the work norm and the capacity of the worker (Maeda, 1977). Specific conditions of work such as shift work, and bonus and overtime incentives are seen to increase pressure and stress (Browne et al., 1984; Elenor, 1981; Maeda, 1977; Stone, 1984). Simple measures of pressure of work, such as length of time spent keying and working hours, appear to have been linked to the

development of RSI (Maeda, 1982; NOHSC, 1985). Oxenburgh (1984), in a limited study of 46 Australian keyboard operators in a private company, concluded that workload was a major causative factor in the development of RSI. He found a significant difference between injured and control groups on time spent per day at the keyboard. The majority (51%) of RSI sufferers, compared to 8 percent of the control group, spent more than six hours per day on the keyboard.

Deadlines: Studies have shown increases in muscle tension as difficult deadlines draw near (Caplan et al., 1975, Friedman et al., 1958; Margolis et al., 1974; Smith et al., 1981). Often deadlines will also necessitate extra keying, increasing the amount of overuse of the muscles compounding the problems associated with tension.

No Breaks: The importance of recuperation has been noted frequently in the literature (Sth Aust. Health Comm., 1984; Mills and Sallans, 1984; Oxenburgh, 1984; Ryan et al., 1984)

The importance of opportunities for recuperation within the job has been stressed by Browne et al. (1984), Maeda and others (1982) and Stone (1984), with several authors blaming the time spent on a repetitive task without sufficient breaks, as contributing to RSI (Caple, 1983; Maeda, 1977). In their study of Data Processing Officers, Taylor and Pitcher (1984) noted that the RSI sufferers tended to work through their rest breaks. Kilbom and co-workers (1984) in Sweden found a high correlation between development of musculoskeletal problems and factors

which implied short rest breaks. In another Swedish study, Bjorksten (1984) cited insufficient rest breaks as one of the three major contributing factors to shoulder and neck pain in medical secretaries.

Overtime : Overtime, which also has an obvious relationship with opportunity for recuperation, has been implicated in stress and ill-health (Breslow and Buell, 1960; Margolis, 1974; Russek and Zohaman, 1958).

Changes : Although related to many of the above factors, McPhee (1980, 1983) has speculated that the risks of strain are greatest under several conditions, one of which is when new demands are placed on the individual. In their study of tenosynovitis in industry, Thompson et al. (1951) saw a major cause as occupational changes necessitating unaccustomed work.

Several authors have suggested that a change in workload may aggravate an existing musculoskeletal problem (Maeda, 1977), or result in RSI symptoms to the extent of a small 'epidemic' occurrence (Howard, 1938). In his study of telegraphist's cramp, Ferguson (1971) found some indication that workload had affected initial onset and recurrence of symptoms. Oxenburgh (1984) noted that 43% of keyboard RSI sufferers had had their workload almost doubled prior to injury.

B : CONVERSION REACTION EXPLANATION OF THE ROLE OF STRESS IN THE DEVELOPMENT OF RSI

Alternative explanations of the role of stress in the development of RSI suggest that symptoms arise as a neurotic response to working conditions and personality factors and at the extreme the need to convert mental stress to a physical symptom as a way of escaping the stress inducing environment.

In 1952, a study by Le Guillant showed the extent of the cognitive demands placed upon female telephone operators and the degree of uniformity in their reactions to the constraint of the job resulting in 'Telephonists' neurosis'. The Le Guillant syndrome has complex roots: high cognitive speed stress, ambiguity of the task and difficult relations with the public. Wisner (1981) reported that since that time it has been shown that this so-called "neurotic syndrome" occurred in all jobs requiring a high degree of mental effort (key-punch operators, workers in the electronics and textile industries, VDU operators). The only variations he suggested:

lie in the outward manifestations, which are specific to the particular constraints of the job. Instead of the auditive problems noted among telephonists, one finds back and neck pains among key-punch operators, and visual and para-vertebral problems among VDU operators. But the basic fact remains that workers subjected to a major mental effort suffer from a neurotic syndrome. (Wisner, 1981, p41)

A somewhat similar analysis supporting the conversion thesis comes from Lucire (1985). She believes that many patients show symptoms of a conversion hysteria similar to that suffered by medical staff at the Royal Free Hospital in London during a polio epidemic in 1955. The staff suffered headaches and muscle pains with no apparent physical cause. In retrospect medical opinions considered that the cause was an hysteria resulting from the dilemma of wanting to care for the sick, and yet the fear of contracting polio. Symptom development gave an honourable resolution to this conflict in that it provided an acceptable reason for avoiding the situation. The analogy was drawn with RSI patients who find the working environment unsatisfactory and wish to leave, but only wish to do so "involuntarily".

The real drawback of this thesis is the inability to empirically test such an hypothesis.

Each thesis (organic or conversion) may be appropriate for particular circumstances. Whether RSI results from the exposure factors and/or a neurotic response to stressful working conditions, converting mental stress into a functional symptom, what is consistently evident is stress. Lipowski (1977) has emphasized the importance of the perception of stress as an intervening variable between the stress and elicitation of physiological change. Yet the existing literature makes no reference to the role of perception. A clear need exists for this deficiency to be redressed with the determination of the perceptions of parameters relating to stress, both on the part of those who determine work practice (authors) and those who carry it out.

As there is no literature available with specific relevance to perception and RSI, the following section discusses the literature which more generally relates to the parameters relating to stress in the work environment and the role of perception in physiological pathology. The minimal literature on the non-work parameter of personal characteristics will also be reviewed as to its contribution to stress.

C : PSYCHOSOCIAL PARAMETERS RELATING TO STRESS AND RSI

The parameters relating to stress and subsequently influencing the incidence of RSI, according to the model, have been divided into two parts. Firstly are those parameters associated with the work environment (A), and secondly, those related to personal characteristics (B). Before these parameters are addressed specifically, the nature of stress and how it relates to health disorders will be briefly discussed.

Since the individual's response to stress is highly personal, it is hypothesized that stress-inducing working conditions will only create tension or the need for conversion if they are perceived negatively (except of course in the case of biomechanical stressors). Thus the individual's subjective perception of work practice and the work environment is more relevant to the development of RSI than the objectively determined situation. As Meister points out:

It is possible that the primary manifestation or agent of stress is experiential and that any physiological and performance effects manifested are merely concomitants: that initially the individual perceives and experiences the stress situation as a cognitive activity and only then are the physiological symptomology and performance effects triggered. Obviously, physiological mechanisms are triggered by the stress perception and these in turn trigger the physiological symptomology" (Meister, 1981, p. 32)

Parameters relating to :(A) The Work Environment

A general emotional strain in response to work can induce symptoms. Caple (1983) noted that fears about job security and financial commitments were producing stress in factory operators. Maeda (1977) contended that mental strain has increased with mechanisation, task specialisation and work speed, while McPhee (1980) cited fear, boredom, and lack of job security as factors linked to the development of RSI. A paper by Cohen et al. (undated) attributed stress to the workers' minimal control over tasks or workplace, boring and repetitive tasks, work overload, close monitoring by supervisors, and fear of being downgraded or replaced by the VDU.

Johansson and Aronsson (1984) in a questionnaire study of the psychosocial stresses associated with VDU use, found that all respondents reported an increase in mental strain, demand for concentration and amount of routine work with the introduction of computerization.

Studies of work-task factors have indicated that under utilization of skills and abilities, low levels of task variety, task clarity, challenge, complexity and activity level are related to increased stress and negative psychological states. Confusion and frustration have also been related to an increased risk of health disorders (Caplan et al., 1975; Frankenhaeuser & Gardell, 1976; Margolis et al., 1974; Smith et al., 1981). Breaking work down into simple units, to reduce

memory work and increase the pace, produces a loss of skill and has brought about low satisfaction jobs with high stress levels and poor worker health (Caplan et al., 1975; Margolis et al., 1974; Smith et al., 1981).

Cakir and his co-researchers (1980) identified feelings of loss of individual control and job alienation as a major consequence of VDT-computer automation of clerical-type work, and found that such feelings were strongly related to reports of fatigue, monotony, stress, and loss of security and job meaning among VDT operators. These effects were amplified in VDT workers with the most routine jobs, and were most severe in qualified clerical staff assigned to routine VDT positions.

Taylor and Pitcher's (1984) study of keyboard operators in Melbourne suggested that a high degree of surveillance can also produce psychosomatic symptoms.

It has also been suggested that the introduction of new equipment raises 'anticipatory' anxiety about jobs and careers which in association with the physical design of the workplace and equipment can lead to injuries such as tenosynovitis (Keeble, 1985).

Parameters relating to :

(B) Personal Characteristics

Although not central to the objectives of this study, some other parameters relating to exposure will be explored. There is a small body of literature which discusses relationships between RSI and factors unrelated to work.

Smoking

Ferguson's study of telegraphists in 1971 revealed a significant association between telegraphist's cramp and moderate to heavy smoking. At a physiological level, smoking has been shown to reduce the blood supply to the hand. This finding is consistent with Welch's (1973) suggestion that deficiencies in peripheral circulation can cause strain.

Marital status and number of children

The development of RSI has been seen as related to several aspects of life outside work, specifically opportunities for recovery from fatigue (McPhee, 1980; Maeda, 1977; Maeda et al., 1982). Elenor (1981) noted the 'double day' of work and home duties for working women as a factor which impeded recovery from work.

Evidence for an association between marriage and children and the development of RSI is not clearcut. Brown and Dwyer (1983) reported that a third of their 74 clients at a Women's

Health Centre were parents of children under twelve years of age. However, because they give no comparable figures for the population at large it is difficult to interpret the real meaning of this statistic. Denehy (1978) found in his study of incidence in that RSI sufferers were generally married with children. In a study of keyboard operators, Hayashi and co-workers (1983) found negative correlations between trunk and neck problems, and children, marriage, and household-centred lifestyle, concluding that these interests outside work helped fortify workers against occupational disorders.

Other extrawork activities

Some reference is made in the literature to the relationship between activities such as playing musical instruments (Fry, 1984), knitting (Birkbeck and Beer, 1975) and doing rubrics cube (Waugh, 1981) and RSI. However, no studies have examined whether keyboard operators, particularly those suffering from symptoms are more likely to carry out these activities in addition to working than those without RSI.

Other symptoms and RSI

An examination of symptoms other than musculoskeletal problems may reinforce the hypothesis that RSI sufferers are suffering from stress or that other symptoms may interact to result in RSI. Several research studies have investigated stress in workers performing repetitive tasks. In a study of 74 clients with RSI, Brown and Dwyer (1983) found that 57 percent

were also suffering from complaints such as anxiety, depression, sleep disturbance, symptoms commonly associated with stress.

Headaches: Headaches are a conventionally recognized symptom of stress used in many stress inventories (see e.g., Hurrell, 1981, Smith et al., 1979). Though the literature on RSI has not discussed the relationship of other work-related health complaints with RSI except those associated with vision.

Vision Problems and RSI: Chalkman and Guest's (1983) review of the literature concluded that eye strain and muscular strain can be related. The evidence suggested that people with visual difficulties adopt a poor posture to compensate for difficulties with viewing work (keyboard, documents and/or keyboard).

Having examined the literature that refers to the model in a factual sense, the relevance of theories on perception will now be discussed, providing as Bateson would refer to it, "the pattern which connects" (1980).

CHAPTER 2

AIMS, THEORY AND HYPOTHESES

PURPOSE

The aims of the present study are to : (1) assess the consensus between authors' and operators' perceptions of salient work environment and work practice issues; (2) examine perceptions of possible causes of RSI amongst those at risk and those influencing work practice; (3) evaluate the validity of exposure conditions considered to be directly related to musculoskeletal injury; (4) analyse the association between psychosocial parameters which are related to exposure factors (particularly those identified with psychological stress) and musculoskeletal complaints; and (5) determine if a psychosocial model can be developed from factors individually associated with musculoskeletal complaints.

ATTRIBUTION THEORY, STRESS AND PERCEPTIONS

Attribution theory provides a unifying context for conceptualization of these objectives, relating to both stress and perception.

In a general sense Heider's theory of the attribution process considered particular behaviour to be caused by environmental forces plus personal forces. Kelly (1967) stressed that attribution is mainly concerned with the cognitive process by which an individual interprets behaviour as being

caused by (or attributed to) certain parts of the relevant environment. Since most causes or attributes are not directly observable, the theory says people must depend upon cognitions, particularly perception, to make interpretations of other persons or of themselves. According to attribution theory, behaviours will vary depending on whether an individual makes internal, personal attributions or external, situational attributions. The type of causal attributions one makes greatly affect further perception. There is growing evidence that this attributional process and the form it takes greatly affects resulting behaviour (Luthans, 1981, p. 197).

The view is rapidly gaining acceptance in the literature that stress is an intervening variable, arising when the organism perceives unacceptable deviations from optimum conditions which are not easy to restore (Welford, 1973). As a theory relating to perception, attribution theory therefore has significant implications (a) as to whether or not stress is experienced by operators and (b) for effective prevention and management strategies of the problem. It is hypothesised that the perceptions of those who determine work practice - the managers and/or authors, are significant variables in terms of both how they behave in the work and how they view solutions to RSI. As Luthans (1981, p. 198) points out "the type of causal attributions one makes greatly affect perception". If authors' perceptions of work practice and the work environment differ from those of keyboard operators, both inappropriate behaviour and an additional source of stress may result from the discrepancy. Furthermore, effective intervention may be

significantly hampered if managers and authors attribute cause to particular aspects of the operators' working conditions with operators perceiving other factors as causal.

Kelley (1973) wrote in concluding his excellent paper on attribution theory:

Man's concern with the reasons for events does not leave him "lost in thought" about those reasons. Rather, his causal explanations play an important role in providing his impetus to action and in his decisions among alternative courses of action. When the attributions are appropriate, the person undoubtedly fares better in his decisions and actions than he would in the absence of the causal analysis. (p. 127)

LOCUS OF CONTROL

Associated with Attribution Theory is the concept of locus of control. According to Kelley (1967) and Nisbett and others (1971) people who perceive internal control feel that they can personally influence their outcomes through their own behaviour. Those who perceive external control feel that their outcomes are beyond their own control. Although not discussed in the literature, it is hypothesized that those who develop musculoskeletal symptoms are more likely to view external reasons for carrying out injurious work practice (e.g. not taking breaks when they could, taking on extra work) than personal motivations. More generally, it is also hypothesised that RSI sufferers will be more likely to rate external reasons (e.g. author expectations) as more important causal factors than

internal (e.g., operator work ethic) reasons.

It is to these unexplored issues that some of the major hypotheses of this study are directed, i.e. reasons expressed for injurious work practice, consensus of authors and operators on work environment and work practice issues. This will provide two important sources of information: 1) identifying those perceptions which are associated with stress and/or musculoskeletal injury, and 2) on what issues authors are unaware of operators' conditions and concerns.

OBJECTIVES

The substantive objective of this project is to identify those parameters (in particular those associated with stress) that are related to symptom development, yet which may or may not constitute generally accepted exposure (risk) factors. The focus is on psychosocial parameters and perceptions of work practice and the work environment that are associated with injury.

This study considers musculoskeletal complaints to be symptomatic of underlying pathology in the work environment. Although less tangible than hardware or medical foci this approach offers a more solid foundation from which preventative strategies can be developed and less likely to result in the "symptom substitution" of some other occupational malaise.

Such a view of musculoskeletal problems as symptomatic accommodates both of the two major divisions in the literature on the relevancy of stress in the development of musculoskeletal injury (see Chapter 1), whether stress is conceived as a function of exposure to risk factors or a neurotic conversion reaction.

Conceptualization of the Dependent Variable

A major problem facing researchers investigating musculoskeletal complaints is their definition. At the macro level, there is neither a universally consistent definition of RSI nor a method of objective diagnosis. At the tissue level, objective evidence is apparently difficult to find. It appears that a variety of regional or poorly localized pain syndromes may act singly or in combination to cause, at the least, "discomfort" and to reduce work performance.

The term RSI is seldom used outside Australia, although other terms used overseas, such as 'occupational cervicobrachial disorder' (OCD) used in Japan, the Scandinavian term 'musculoskeletal complaint' and the USA's 'cumulative trauma disorder' appear to describe injuries very similar to RSI. Even within Australia, there are differences of opinion on the precise definition of the condition. Most reports and research projects have dealt with this lack of consensus by assuming equivalence of the terms, using generic labels such as RSI or musculoskeletal problems and specifying their own definitions

for their particular objectives.

For the purpose of study, the dependent variable, has been conceptualized in two ways. Firstly, those with a medical diagnosis of RSI, carpal tunnel syndrome or tenosynovitis have been contrasted with those experiencing no musculoskeletal symptoms. Musculoskeletal symptoms are defined as complaints of pain, aching, stiffness, swelling, cramp, soreness, weakness, tingling, numbness occurring in the upper body (neck, back or shoulders) or peripherals (arms, elbows, wrists, hands or fingers).

The second formulation of the dependent variable was comprised of four occurrence categories - no musculoskeletal symptoms, occasional musculoskeletal symptoms, weekly musculoskeletal symptoms and daily musculoskeletal symptoms.

MAJOR HYPOTHESES AND RESEARCH QUESTIONS

ATTRIBUTION

A number of major hypotheses and research questions have been developed. As attribution influences perception, those hypotheses and research questions relating to attribution of cause take prominence. Hypotheses 1 to 4 explore how both authors and operators attribute causal influence to the increased incidence of RSI.

PERCEPTIONS OF THE WORK ENVIRONMENT

These hypotheses are followed by hypothesis 5 which examines how authors and operators perceive the work environment. Areas of discrepancy and consensus between sufferers and nonsufferers, authors and operators are sought. Thus it can be determined if different operator perceptions of the work environment predict musculoskeletal complaints.

THE MODEL

The next group of hypotheses relate to the model developed in the Introduction. Hypotheses are organized according to the contexts outlined by the model.

(1) Exposure (Risk) Factors

The objective of Hypothesis 6 is the exploration of those factors suggested in the literature to be exposure (risk) factors. Although some of these factors have been researched, no research endeavours have combined these multiple factors within a single study. If the present research confirms earlier findings from disparate sources, the validity of the new hypotheses is further bolstered.

(2) Stress and its relationship with Injury

Hypotheses 7 to 10 investigate stress in the work environment. Specific hypotheses have been developed analyse the association between other health complaints, musculoskeletal

problems and stress.

(3) Psychosocial Parameters

Psychosocial parameters relating to exposure are to be examined in the context of Hypotheses 11 to 14 as they relate to : (A) the work environment, and (B) worker characteristics. Particular emphasis is placed on operator/author interaction and the relationship between locus of control and author/operator interaction as they relate to injury.

From such data, the final hypothesis addresses itself to the development of a model which can best predict the occurrence of musculoskeletal problems from the available data.

OTHER ISSUES

Following these hypotheses are a number of, as yet, unresearched issues which are also investigated.

THE HYPOTHESES

ATTRIBUTION OF CAUSE

Hypothesis 1: Authors and keyboard operators will differ in the importance attributed to causal influences.

Research Question 1a: What factors are considered important by keyboard operators and significantly less important by authors?

Research Question 1b: What factors do authors and operators consider unimportant?

Hypothesis 2: The difference of attribution between authors and their keyboard operators will be related to an increased likelihood of those operators suffering from RSI.

Hypothesis 3: Both authors and operators will agree in attributing factors related to organization features of the work environment and work practice with high causal influence.

Hypothesis 4: Authors will attribute higher causal importance to operator characteristics than operators and operators will attribute higher causal importance to author characteristics than will authors.

PERCEPTIONS OF WORK PRACTICE AND THE WORK ENVIRONMENT

Hypothesis 5: Perception of work practice and the work environment will differ between authors and the keyboard operators who work for them, particularly where the operator suffers from work-related complaints.

DETERMINING THE VALIDITY OF THE PROPOSED MODEL

(1) Exposure (risk) factors

Hypothesis 6: Identifiable exposure factors are related to the development of musculoskeletal problems.

- a) The physical environment (e.g. comfort of furniture and equipment)
- b) Job-person fit (e.g. age, training, vision, experience, health history)
- c) work practice (e.g. quantity, overtime, deadlines, restbreaks, changes prior to injury).

(2) Stress and its relationship with ealth complaints

Hypothesis 7: Work environment, work practice and personal factors identified as stressors will be related to the development of RSI.

Hypothesis 8: The number of health complaints (musculoskeletal and nonmusculoskeletal) will be related to stress.

Hypothesis 9: RSI sufferers are more likely to complain of other, non-musculoskeletal symptoms than are non-suffers.

Hypothesis 10: Vision problems will be related to musculoskeletal complaints.

(3) Parameters relating to (A) The work environment

Locus of Control

Hypothesis 11: Sufferers will be more likely to perceive an external locus of control than nonsufferers:

a) view author and/or organizational factors
rather than personal motivations as reasons for :

i) not breaking when they could,

ii) taking on extra work,

- b) less likely to feel they have control over work;
or input into decisions affecting them.

Author/Operator Interaction

Hypothesis 11: There will be a discrepancy between authors and operators in terms of expectations of work norms.

Hypothesis 12: Particular author practices or working styles will be related to perception of the working environment as stressful and/or the occurrence of musculoskeletal symptoms in their operators.

(3) Psychosocial parameters relating to

(B) Worker characteristics

Hypothesis 14: Sufferers be characterised by:

- a) particular demographic descriptions
(e.g. marital status, number of children)
- b) self rated psychological characteristics
- c) health habits (e.g. regular exercise,
sleep, tobacco and coffee consumption)
- d) extrawork activities that are repetitive
and straining

Hypothesis 15: A psychosocial model can be developed as a predictor of RSI which includes exposure factors and parameters relating to the work environment and worker characteristics.

OTHER RESEARCH ISSUES

What factors discourage keyboard operators from reporting symptoms?

Is age related to discomfort with environmental conditions?

What is the most frequently reported problem site? Is this related to age or years spent keying?

Do sufferers find relief from their symptoms? What brings this relief? Is relief different for different sites?

CHAPTER 3

METHODS

To explore the proposed hypotheses and research questions, the research was based on questionnaire data. A self administered questionnaire was chosen as the most appropriate method of approach to investigate the perceptions and circumstances of those directly and indirectly involved with keyboard work. As a method it enabled measurement of a population that could not, within the constraints of this study, be observed directly. This technique offered a less restrictive way of making generalizations about the wider keyboard population as a more representative sample was possible. As the emphasis was on perception and opinion, an anonymous questionnaire was considered less likely to result in "socially desirable" responses that may have occurred if an interview was used. The questionnaire was long, however, as Heberlein and Baumgartner (1978) have argued, the perceived importance of a questionnaire may be associated with its length. In practice there was no problem with length and a high rate of response was attained.

Groups to be surveyed were defined by the nature of their job (keyboard operators who primarily worked for authors, supervisors and those who provide work for keyboard operators - authors). Although supervisors were surveyed, it was not possible to include them in the present study for clarity of analysis and because of their small sample size (n=17).

The exploratory objectives of this study are reflected in analyses which aim for conceptual clarification and the discovery of extreme conditions and associations, typical and unusual configuration of variables and general patterns. Its descriptive objectives called for measures of central tendency and modal responses contrasting the major subgroups. Integrant in achieving these objectives has been the development of original scales and measures which are described below.

RESEARCH INSTRUMENTS

As psychosocial investigation of musculoskeletal complaints, particularly in keyboard workers, is still in its infancy and the area of particular interest has not been explored, it was necessary for an original questionnaire to be developed for the purpose of this study. The exploratory questionnaire was devised on the basis of examination of the existing literature, numerous consultations with those directly and indirectly involved with keyboard work, and injured workers. Unionists (2), support groups (2) and their members (23), managers (5), supervisors (8), authors (15), injured and non injured keyboard operators (16), medical workers - occupational therapists (4), surgeons (2), general practitioners (5), nurses (3), physiotherapists (3), psychologists (4), accupuncturists (2) and many others were interviewed during the preliminary phase of the study. In addition, contact with other researchers from various disciplines (e.g., medicine, social psychiatry), organizations (e.g., Microsearch) and institutions (e.g., Monash

University) and government bodies (e.g., Australian Public Service Association, Public Service Board, National Occupational Health and Safety Commission, RSI Task Force) was also made. The opinions and questions raised by these diverse groups contributed significantly towards the formulation of a questionnaire with unique relevance to this little explored area.

THE QUESTIONNAIRES

Questionnaires were developed to assess a number of areas covering demographic details, perceptions of work practice and work environment issues, health and injury data and opinions about the causes of RSI. Three questionnaires were devised in order that the perceptions and opinions of those most directly influencing keyboard work and the keyboard operators' work environment could be solicited (see Appendicies A, B and C). The key groups selected were those who determine keyboard operators' work - the authors, supervisors and keyboard operators. In their final form, questionnaires for each class were comprised of a number of sections. These sections were as follows:

Demographic: The first section for each group was concerned with general descriptive details generally characterizing workers.

Work Practice: A work practice section followed and was designed to explore opinions about and attitudes to work practice, in particular as it related to keyboard operators.

Responses ranged from dichotomous yes/no to specific quantitative details.

Working Environment: Another section which was similar for all groups sought to elicit opinions from each group about keyboard operators' working environment, phrased according to the target response groups. For example, keyboard operators were asked to rate the validity of statements such as "'Urgent' work given to me by authors is always really essential", whereas, the corresponding statement for authors was "'Urgent' work I give to my keyboard operators is always really essential.' Responses were ratings from 1 to 5 on a Likert-type scale. Questions were appropriately balanced for positive and negative statements but recoded for analysis.

Health and Injury Related Questions: Only keyboard operator questionnaires included a section dealing with health and injury related issues. A subsection was specifically designed only for those with musculoskeletal symptoms. Here also responses varied from simple yes/no dichotomies to quantitative estimates.

Attribution: A final section, was an opinion survey requesting participants to rate their perception of the importance of various factors leading to an increased incidence of RSI. This section was identical for all three groups. Response categories ranged from one to five representing very important to not important, and once again balanced for negative and positive responses and recoded for analysis.

MEASUREMENT OF VARIABLES

The Dependent Variable

In view of the difficulty in defining RSI, two scales were created. The first was a dichotomous comparison between those diagnosed by a doctor as having RSI and those reporting no work-related musculoskeletal symptoms. Musculoskeletal problems are, for the purpose of this study, classified as complaints of pain, aching, stiffness, cramp, swelling, soreness, weakness, tingling or numbness in the upper body - neck, shoulder and back and/or in the peripherals - arms, wrists, hands and fingers.

The second scale was constructed on the basis of subjective responses to questions about symptom occurrence. The resultant four category scale ranged from expression of no symptoms through to at least one symptom experienced daily. Those with symptoms which were present up to twice a week were placed in the weekly symptom group. Symptoms occurring less than once a week were classified as occasional sufferers.

Other minor dependent variables were primarily related to subjective measures of stress and general site of injury - a) upper body (neck, shoulders and back), and b) peripherals (arms, hands and fingers).

SPECIFIC QUESTIONNAIRE MEASURES

For easy reference to the location of the actual questions in the questionnaires, the appendix identification, part number and question number are provided in brackets (e.g., (A(2)6,7) refers to Appendix A, part 2, questions 6 and 7).

ATTRIBUTION

To determine how authors and operators attributed causes of RSI an inventory of forty-six factors was created. Respondents were asked to rate the importance of these factors in leading to an increased incidence of RSI on a 1 to 5 Likert-type scale ranging from 'Not Important' to 'Very Important'. These factors were then categorized as organizational, psychological (operator), psychological (author), behavioural (operator) and behavioural (author), the composition of which are indicated in the results section (A(5)1 to 24; B(4)1 to 24).

PERCEPTION OF THE WORK ENVIRONMENT

To establish the nature of how operators and authors viewed their actual work practice, work environment and behaviours an inventory of statements relating to these factors was devised.

Although several scales are available to determine the nature of the work environment, none were found to be

particularly relevant in terms of the specific target population.

Responses to these statements also formed the basis for analysis and testing of other research questions and hypotheses directed more specifically to the content of the statements. Response categories ranged from 'definitely true' to 'definitely false'. e.g. 'There is a lot of group support at work'. (A(4)1 to 20; B(3)1 to 17).

Where appropriate, statements and questions were phrased according to the particular sample, referring to the work environment of operators, e.g., Author statement :

"There is enough time for my steno/operator to take rest breaks",

and the equivalent Operator statement:

"There is enough time for me to take rest breaks".

THE MODEL

A : ORGANIC THESIS

(1) Exposure (risk) factors

In order to test the numerous statements about risk factors in the literature several questions were posed to establish the validity of these associations for this sample.

a) Physical Environment

Other measures required more subjective responses. For example, physical environment was assessed in terms of comfort ratings as objective measures of conditions were not feasible, nor consistent with the aims of this study which were to assess perception of the work environment. Subjective ratings of comfort were sought on eight (8) essential elements of the physical environment considered important in the literature - temperature, space, aesthetics, desk, chair, keyboard, air, lighting (A(1)15).

Another feature of the physical environment used as a measure of that environment was the 'easy adjustability' of desk, chair, keyboard and screen, requiring a simple yes/no response (A(2)28).

b) Job-person fit

Job-person fit was determined on the basis of questions relating to capacity to carry out work. These included questions as to age (A(1)6), self rated feelings of competency (A(4)18), rating of training adequacy on equipment and for duties (A(2)21), how training was provided (on job, read the manual or formal training) (A(2)22,23) and 'How long have you been working on a keyboard?' (A(1)5).

c) Work Practice

Questions referring to work practice conditions considered to be risk factors were comprised of such questions relating to the amount of overtime and the frequency of deadlines in both author and operator questionnaires (B(2)4,9), (A(2)8,16).

Less specific factors relating to opportunities for recuperation were tested with questions relating to nature of breaks (A(2)5), missing breaks (A(4)10,12) activity during breaks (A(2)6).

Changes: Straight forward yes/no responses formed the basis for determination of the nature of changes that had occurred prior to injury, (A(3)10), e.g.,

'Was there any change in your equipment or furniture just prior to injury?',

'Did the problems follow any long absence from work (e.g., sick leave, recreation leave, maternity, etc.)?'.

(2) Stress parameters

Measures identifying subjective assessment of stress were developed on the basis of interviews and from the literature.

Included in the list of variables were those commonly used in work stress scales (cf. Insel and Moos, (1974)) and included response related to measures of perception of the work environment, for example:

'I am concerned about the security of my job'

'My work requires intense attention and concentration'

In addition, more general questions sought to determine how stressful respondents found a) work (A(2)17), and b) home (A(3)21), to be over the last year, with 5 response categories ranging from 'not at all stressful' to 'extremely stressful'.

Further, several self-rated questions about recent crises (A(3)20) and coping ability (A(3)22) were also included in the keyboard operators' questionnaire.

B : THE CONVERSION THESIS

Although part of the model, the Conversion Thesis is not to be examined within the scope of this thesis, nor can it in fact be tested.

C : PSYCHOSOCIAL PARAMETERS

In order to address the parameters relating to exposure, two sources of influence were identified, (A) The work environment and (B) Personal Characteristics. A number of questions were developed to assess the influence of psychosocial factors related to both parameters.

(3) Psychosocial parameters relating to

(A) The Work Environment

The major psychosocial influences related to the work environment were those to do with author/operator interaction, the nature of the workload as well as issues relating to locus of control and obstacles to recuperation.

Author Operator Interaction

Measure of work norm discrepancy: The first item related to the nature of the workload. Respondents were asked to specify a) the number of times they felt it was reasonable to be asked to retype documents of both low and high importance. In addition, they were asked b) how often this number was exceeded (A(2)9;B(2)6). Scores thus obtained could be compared between authors and their operators and between sufferers and nonsufferers.

As keyboard operators' work practice is determined considerably by authors, it was considered both relevant and necessary to include variables that interviewees had found stressful in this interaction. Equivalent questions were posed to authors, seeking their perceptions of the same conditions. Some of these questions were:

'Do authors stand/sit next to you while you complete work for them?'

'Do you mind if they do?' (A(2)15;B(2)10)

'Who would criticise you for taking breaks?' (response

categories included noone, other operators, authors, supervisors) (A(2)13)

'Authors have realistic expectations of me and the work I do' (statement rated on a 1-5 scale ranging from 'definitely true' to 'definitely false') (A(4)7)

'Do authors encourage you to take breaks?' (A(2)27)

Author working style was determined by both operators and authors on four continua: Supportive-Unsupportive, Considerate-Inconsiderate, Undemanding-Demanding, Relaxed-Authoritative. Five response categories were possible (A(2)29;B(2)15).

Locus of control

Specific questions were devised to establish why operators felt they did not take breaks when they could. These questions were designed to discover what factors are perceived by operators as obstacles to this particular healthy work practice.

The first question related to reasons given for not taking breaks was framed "If you do not take breaks when you could, is it usually because of any of these reasons?" Eleven possible reasons, commonly cited by the interviewees mentioned earlier, were given (A(2)14). The responses were categorized into three classifications, Operator characteristics (items a,e,f,g), Organization determined factors (including hardware) (items b,c,d,k) and Author determined conditions (items h,i,j).

A second question was designed more specifically to examine why operators took on extra work (A(2)11). Those who indicated that they resisted saying 'no' to requests to do extra work, were asked to indicate why they did so from a list of eight items.

To determine how much control operators had in their work environment in a general sense, operators and authors were asked to rate operators' input into decisions affecting them (A(4)5;B(3)5), amount of control over the planning and carrying out of their work (A(2)20) and their involvement in workplace changes (A(2)25).

(3) Psychosocial parameters relating to

(B) Worker characteristics

a) Demographic descriptions

Demographic details were determined on the basis of simple questions relating to marital status (single, married, separated, divorced, widowed)(A(1)9) and number of children in each of four age categories (under 6, at primary school, at high school, completed school)(A(1)4).

b) Self rated psychological characteristics

Keyboard operators were asked to describe themselves at work on 5-point continua similar to those for rating authors' working style. The dichotomies were however different:

Extroverted-Introverted, Relaxed-Tense, Worrier-Nonworrier, Shy-Confident, Perfectionist-Easygoing, Dominant-Submissive, Workaholic-Leisurely (A(3)23). Such categories were created on the basis of interviewees characterizations of symptom sufferers. Such superficial ratings were not designed as true assessments of personality, but rather to suggest directions for further investigation.

c) General health habits

Consumption of coffee (A(1)13) and cigarettes (A(1)14), sleep (A(1)15), hobbies (A(1)10) and relaxation (A(1)11) were determined with the appropriate quantitative and qualitative responses.

Level of fitness: As a measure of fitness, respondents were asked a) what type of regular exercise they did, b) how often and c) for how long each time. Those meeting the criteria of at least twice a week for at least fifteen minutes (15) each time were classified as regular exercisers (A(1)12).

d) Extrawork activities

A list of eight hobby/activity categories were listed (e.g., knitting, playing a musical instrument, painting/drawing/writing) and respondents were asked:

'Do you do any of the following hobbies at least once a week?
If yes, how many hours per week would you spend doing them?'

Yes and no boxes were provided as well as a space for the

number of hours per week (A(1)10).

OTHER ISSUES

Health

The Health section of operators' questionnaires contained several questions relating to details about injuries (including site, frequency of occurrence, diagnosis) as well as days off work, other symptoms and injuries, medications and relief measures (A(3)1 to 9, 11 to 15, 17 to 19).

Non-reporting

Reasons for not reporting injuries were sought with five predetermined responses options and an open ended sixth categoraining, types of training. Appropriate response categories were provided (A(3)16).

RELIABILITY

In this study a number of steps were undertaken in the endeavour to construct adequate measures of the concepts. As has been described above, sets of items were devised that appeared, on the face of it, to measure each concept. As a general indication of consistency of response, reliability estimates were calculated using the Spearman Brown split-half formula for negatively worded statements and positively worded statements separately. Reliability for negative statements was calculated to be .78 ($p < .001$) implying a relatively high internal consistency for these statements. A similarly high consistency score was obtained for positively worded statements (.81, $p < .001$).

STATISTICAL ANALYSIS

Statistics were calculated using the Statistical Package for Social Sciences (X) (1983). Throughout χ^2 refers to chi-squared tests of association, computed to test for the independence of variables. The underlying assumption of independent samples was met. Where cell counts were less than five (5), categories were combined (Guilford and Fruchter, 1982, p. 206).

Student's t tests were calculated to test hypotheses about equality of means (Hays, 1981, p.273-280). Because of the lack of data on RSI, there were no clear expectations as to direction of results, therefore two-tailed tests were used as a more

conservative test. Author and operators were treated as paired samples. Where samples were not matched and unequal in number, e.g., RSI and no symptom group, independent t tests were carried out using pooled variance as the best estimate of sample variance. For all t tests, the assumptions of normality, independence and homoscedasticity were not violated. For comparison of more than two groups, one way analyses of variances were performed, leading to overall significance tests of the null hypotheses.

Correlations of the appropriate data were calculated using Pearson's correlation coefficient (r), based on the assumption that ratings and occurrence of symptoms can be considered to form continuous scales.

A multiple regression procedure was utilized in an exploratory sense to test an overall model for this sample.

Checks were carried out using different analysis strategies to reduce the likelihood of spurious results occasioned by multiple analyses.

THE PILOT STUDY

Fifteen keyboard operators, five authors and four supervisors completed a pilot questionnaire to test the design and comprehensibility of the questionnaire and also to take into account their comments and suggestions regarding its

possible improvement.

On the basis of their responses and comments, a number of modifications were made.

THE MAIN STUDY

Sample and Procedure

Sample

Three federal government departments in Canberra were approached and invited to participate in an exploratory investigation of factors related to RSI amongst keyboard operators. Authors, supervisors and keyboard operators generally classified as typist or steno-secretary were informed of the study and were asked to participate. Sixty eight (68) keyboard operators and twenty-five (25) authors from the Department of Foreign Affairs returned questionnaires, with 60 keyboard operators and thirty eight (39) authors from the Australian Bureau of Statistics and sixteen (16) keyboard operators and fifteen (15) authors from the Taxation Department. Thus a total of 144 keyboard operators and seventy-eight (79) authors returned completed questionnaires. Given the nature of the samples and the fluctuating numbers within each work place, it was not possible to determine the total possible number of respondents. However, of the 150 operator and 85 author questionnaires distributed, 144 operator and 79 author

questionnaires were returned completed (96% and 92.9%), representing a very high response rate.

Authors were identified by keyboard operators as "the person for whom they did the most work". Keyboard operators were given both author and keyboard operator surveys and were requested to ask their main author to complete his/her questionnaire. Keyboard and author surveys were returned together in order that pairs could be matched on specific questions. Responses from those who could not identify an author were combined with those who were able to identify an author creating a larger general sample of keyboard operators.

The questionnaires were designed for self enumeration. Although provision was made for names, it was explained that identification was not necessary if keyboard operators and their respective authors attached their sealed response envelopes together.

Questionnaires were distributed personally by the researcher or a departmental employee. Respondents were given approximately one week in which to complete the questionnaire. Keyboard operators were requested not to collaborate with authors in answering their questionnaires. Respondents were assured that all materials would be treated as strictly confidential and anonymously except for numerical coding to identify matched pairs. They were also assured that all data would be analysed in aggregate form only. Departments were promised feedback concerning results.

CHAPTER 4

RESULTS AND DISCUSSION

DETERMINATION OF THE DEPENDENT VARIABLE

Testing of hypotheses and research questions required the differentiation of sufferers and nonsufferers. This differentiation was accomplished with two 'scales' of symptom determination. The first was a dichotomous distinction between those diagnosed as having RSI (including tenosynovitis and carpal tunnel syndrome) and those reporting no musculoskeletal symptoms. A second scale was comprised of categories referring to relative frequency of occurrence of symptoms. The four categories were daily symptoms, weekly symptoms, occasional symptoms and no symptoms.

Tables 2a and 2b outline the distribution of respondents according to these classifications.

Table 2

Distribution of Respondents on the
Dependent Variables

a) Dichotomous Distinction : RSI and No symptoms

CATEGORY	FREQUENCY	PERCENT OF TOTAL N
Diagnosed RSI	17	14.8
No symptoms	20	17.4
TOTAL RESPONDENTS	144	

Note: The remaining 67.8% had undiagnosed
musculoskeletal symptoms

b) : Symptom Occurrence scale

CATEGORY	FREQUENCY	PERCENT OF TOTAL N	PERCENT WITH RSI (N)
Daily symptoms	37	30.8	50.0 (5)
Weekly symptoms	17	14.2	50.0 (2)
Occasional symptoms	46	38.3	45.5 (10)
No symptoms	20	16.7	
TOTAL	120	100.0	(17)

Thus those with RSI were evenly distributed within the
symptom occurrence groupings.

DESCRIPTIVE DATA ON AUTHORS

Table 3 outlines the designation of Authors who completed questionnaires.

Table 3

Distribution of Authors by Designation

DESIGNATION	FREQUENCY	PERCENTAGE
Head of Department	1	1.3
Assistant Secretary, First Assist. Secretary	44	55.7
Director, Clerk 10, 11	14	17.7
Assist. Research Officer Supervisor Clerks to class 9	16	20.3
Missing Response	4	5.1
TOTAL	79	100.0

The following table (Table 4) illustrates the gender of authors identified by operators as their main author. The total number is of course greater than the total number of authors responding as more operators completed questionnaires than authors.

Table 4

Gender of Authors Identified by Operators as Their
Main Author by Operator Symptom Group

GENDER	OPERATOR SYMPTOM GROUP					TOTAL
	RSI	Daily	Weekly	Occas.	No Symptms	
Male	8	30	15	28	12	93
%	100.0	93.8	100.0	90.3	75.0	
Female	0	2	0	3	4	9
%		6.2		9.7		

Because of the small number of women authors, it is difficult to assess the significance of this distribution.

ATTRIBUTION OF CAUSE

Hypothesis 1 proposed that authors and keyboard operators would differ in the importance attributed to causal influences.

In order to determine how operators and authors perceived the causes of RSI, authors and their paired operators were asked to rate the importance of forty-six factors in influencing the increased incidence of RSI on a 1 to 5 Likert scale. These factors were then categorized as organizational (including hardware), psychological (operator), psychological (author), behavioural (operator) and behavioural (author).

Paired t tests were carried out to determine on which causes the matched author/operator pairs agreed and those which reflected a significant difference in mean response rating ($p < .05$). Those causes which showed significantly different ratings between authors and operators were further analysed with analysis of variance.

Research question 1 sought to determine those factors considered important by operators and significantly less important by authors.

The data shown in Table 5 identify those factors considered important by operators and significantly less important by authors.

Table 5

Factors considered important by operators and significantly less important by authors.

CAUSAL FACTOR	CATEGORY	MEAN RATING Operator/ Author #	S.D Operator/ Author	T VALUE
Delay in Reporting	Behav.(op)	3.5 2.9	.7 1.0	4.14*
Chair	Org/Hdwr	3.5 3.1	.9 1.1	2.57*
Desk	Org/Hdwr	3.4 3.0	1.0 1.1	2.18*
Typing too fast	Behav. (op)	3.5 3.2	.7 1.0	2.62*
No control over work	Org	3.1 2.6	1.0 1.0	2.60*
Light	Org/Hdwr	3.2 2.3	1.1 1.3	3.97*
Equipment Training	Org	3.0 2.5	1.1 1.1	2.62*

* denotes significance at $p < .05$, two-tailed test
 # figures adjusted so that: 5=important, 1=unimportant

Items on which authors and operators agreed were important were keyboard, quantity of work, number of deadlines, not taking breaks, and typing for too long, all factors relating to organizational features.

The results thus suggest that although authors and operators agree on many of the factors considered in literature to be exposure factors (to be discussed in more detail later in relation to Hypothesis 3), there are also discrepancies. The publicity given to risk factors would appear to have been successful, however factors considered important by operators are still not recognized as such by authors (i.e., hardware - light, chair, desk, operator behaviour - typing too fast and delaying reporting of symptoms and the organizational feature of not having control over their work). If authors can or do influence interventions related to these factors, such findings suggest the need for them to be made aware of what operators consider are important factors influencing RSI which need to be assessed. Although recognizing the importance of quantity and deadlines, authors appear not to be aware of the pragmatic consequences that such factors imply typing fast.

Hypothesis 2 predicted that discrepancies between authors and operators would be related to an increased likelihood of that operators suffering RSI or more frequent symptoms.

The difference between author and operator means was computed for those factors indicating significantly different

ratings by authors and operators. An F statistic was then calculated to determine the between group difference of the mean author/operator difference in rating using oneway ANOVA after Bartlett's-Box F test confirmed homogeneity of variance (see Tables 6a and 6b).

A significant between group difference was presented on the two causal influences that relate to author/operator interactions "No control over work" ($F=2.36$, $p<.06$) and "Author Expectations" ($F=2.49$, $p<.05$). On the rating of the causal influence of author expectations, the weekly symptom group indicated the greatest discrepancy between authors and operators, with the no symptom pairs indicating the greatest consensus. Ratings by authors and operators differed the most on the importance they attributed to "not having control over work" and "author expectations" in influencing the incidence of RSI. The no symptom group indicated the least difference between authors' and operators' mean ratings, with the weekly group showing the greatest discrepancy. As predicted, consensus between authors and operators was greatest where the operator was symptom free, indicating a greater mutual awareness between operators and authors on issues which related to their interaction. It is difficult to interpret why the weekly group should present such a significant difference. It is possible that this group, who complain of symptoms at least twice a week, are suffering a more chronic condition than those suffering symptoms daily.

Table 6

Analysis of Variance of Author/Operator
Mean Difference Between Symptom Groups
for Two Causes:

a) Author Expectations

ANALYSIS OF VARIANCE					
SOURCE	D.F.	S.S.	M.S.	F RATIO	F PROB.
Between	4	14.09	3.52	2.49	.06
Within	59	83.52	1.42		
TOTAL	63	97.61			

b) No Control over work

ANALYSIS OF VARIANCE					
SOURCE	D.F.	S.S.	M.S.	F RATIO	F PROB.
Between	4	20.68	5.17	2.36	.06
Within	56	122.53	2.19		
TOTAL	60	143.21			

Hypothesis 3 proposed that both authors and operators would agree in attributing organizational factors with high causal influence. It was also hypothesised as a corollary, (Hypothesis 4) that authors and operators would disagree on the significance of personal factors - authors attributing more significance to operators' personality and operators attributing more significance to author factors.

Table 7 presents those factors which both operators and authors attributed causes with equally high importance.

Table 7

Mean Ratings on Factors Attributed with High Causal Influence by both Authors and Operators

FACTOR	CATEGORY	MEAN RATING	S.D.	T VALUE
Not enough break time	Org	3.65	1.1	.52 (NS)
Deadlines	Org	3.55	1.2	.54 (NS)
Keyboard	Org/Hdwr	3.56	1.1	.51 (NS)
Quantity	Org	3.45	1.3	.07 (NS)

(NS) denotes not significant at $p < .05$

Part b) of Research Question 1 sought to identify those factors viewed as "not important" by both operators and authors.

Factors considered to have little influence on the incidence of RSI by both groups were malingering, fear of technology, consumption (e.g., smoking) and fitness of operators, and the influence of compensation laws and unions. Although a great deal of anecdotal discussion indicates that these more value laden factors are significant influences, respondents in this sample did not rate these factors as important. This could be interpreted as a lack of willingness to admit prejudices on the part of some or a belief that these

influences are unimportant.

The data presented in Table 7 support Hypothesis 3 that both operators and authors would agree in attributing high causal influence to organizational factors.

Hypothesis 4 predicted that authors and operators would view psychological factors as important, though would disagree in terms of whose psychological factors were important.

The four psychological factors included in the listing of causal influence are author expectations and author attitude (author psychological factors) and personality and work ethic of operator (operator psychological factors). As Table 8 demonstrates, operators rate author expectations and attitude as significantly more important than do authors ($t=3.32$, $p<.05$, $df=69$; $t=1.13$, $p<.05$, $df=7$). The hypothesis that operators would rate author factors as more important was thereby substantiated. Although the two operator psychological factors did not reveal a significant difference between author and operators' mean ratings, closer examination of the data showed proportions in the predicted direction - more authors than operators regarded operator personality factors as important. Despite its lack of statistical significance both factors are the only ones on which authors attributed greater importance than did operators.

Table 8

Author and Operator Mean Causal Ratings
of Psychological Factors

CAUSAL INFLUENCE	MEAN RATING Author/Operator	S.D.	T-VALUE
Author Attitude	2.4 2.9	1.3 1.1	1.13 *
Authors' Expects	2.7 3.2	1.1 1.0	3.32 *
Operator Personality	2.8	1.6	.60
Operator Work Ethic	2.7	1.6	.88

* denotes significant difference ($p < .05$, two-tailed test)

The results thus confirm Hypothesis 1 that authors and operators differ in the importance they attribute to causal influences. The factors on which discrepancy occurs suggest areas to be examined where intervention is to take place, both in terms of awareness raising and organizational strategies.

Table 9 provides a summary of the findings related to attribution of cause, representing those factors indicating significant differences, non significant trends and factors on which there was clearly no significant difference.

Table 9

Summary Table of findings related to Authors' and Operators' ratings of Causal Influences

FACTOR	DISCREPANCY
Delay in Reporting symptoms	Signif. +
Chair	Signif. +
Desk	Signif. +
Typing too fast	Signif. +
No control over work	* Signif. +
Lighting	Signif. +
Equipment training	Signif.
Author expectations	* Signif.
Author attitude	Signif.
Operator personality	Trend
Operator work ethic	Trend
Not enough time for breaks	N.S. +
Deadlines	N.S. +
Keyboard	N.S. +
Quantity of work	N.S. +
Compensation Law	N.S. -
Malingering	N.S. -
Fear of technology	N.S. -
Consumption patterns of operators	N.S. -
Operator fitness	N.S. -
Union activity	N.S. -

N.S. not significant

+ considered particularly important
- considered unimportant

* difference also reflected in symptom groupings of operators

From analysis of attribution of causes discussed above, the results which follow describe and explore the relationships between perceptions of actual work practice, the work environment factors and symptom occurrence. Contrasts are made between those with diagnosed RSI and those with no symptoms on

various items. Correlations using the scale of symptom occurrence are also calculated in order to determine if particular outcomes can be predicted. In addition, where appropriate, the perceptions of authors are compared with those of keyboard operators on matched questions and where a discrepancy is evident, the data is further analysed to determine if the different perceptions also predict RSI.

PERCEPTIONS OF WORK PRACTICE AND THE WORK ENVIRONMENT

Hypothesis 5 predicted that perception of work practice and the work environment would differ between: a) authors and their keyboard operators, particularly where the operator suffered from work-related symptoms.

The equality of mean responses of Author/Operator pairs on issues relating to work practice and work environment was tested. With the paired sample design, two-tailed t-statistics were calculated for several important factors. Prior to calculation of the statistic, distributions were checked for normality and homogeneity of variance.

Non Consensus Issues

Operator Attitude to Work: Authors considered operators' work to be more challenging, critical and skillful than did operators ($t=2.4$, 67 df, $p<.02$). They also felt operators were more committed to their job and more comfortable with technology than operators rated themselves ($t=3.01$, 73df, $p<.005$ and $t=3.06$, 72df, $p<.005$).

Nature of the job: The work done by operators was viewed by authors as less stressful and more boring than operators rated it to be ($t=2.45$, $p<.02$, 78df and $t=4.64$, $p<.01$, 71df).

Training: There were significant differences between authors and operators in terms of their assessment of the adequacy of training in duties and on equipment. Authors considered operators to be more adequately trained in the use of equipment than operators felt they were ($t=4.26$, $p<.001$, 74df). In contrast, operators rated their training in duties more positively than did authors ($t=4.51$, $p<.001$, 72df). It is suggested that authors are less satisfied with the actual work done by operators, yet do not feel their training in the use of equipment is as lacking as operators recognize it to be.

Author/Operator Interaction: Authors believed that they gave more feedback to operators about the work they did and that they had more realistic expectations of operators than operators felt to be the case ($t=7.6$, 73df, $p<.001$ and $t=5.62$, 73df, $p<.001$). Authors also felt that the urgent work they gave to operators was more often really essential than did operators ($t=6.96$, 72df, $p<.001$).

Organization: Operators felt they had less input into decisions affecting them and that there was less time for taking rest breaks than authors ($t=4.65$, 73df, $p<.001$ and $t=3.51$, 73df, $p<.001$).

Operator Behaviours: Operators find it more difficult to "say no" than authors realize ($t=2.37$, 72df, $p<.02$).

Consensus

Those issues on which both operators and authors agreed related to equivalent estimation of the amount of time operators spend at the keyboard and in carrying out "domestic chores" for the author. Both groups agreed that it was unreasonable to type the same article an unlimited number of times and authors were aware of operators' perception of greater stress involved in typing important documents.

Authors and operators did not differ in their estimation of the amount of overtime (including over lunch) done by operators. Consensus was also apparent between authors and operators on the frequency with which deadlines were set.

Analysis of variance calculated on the mean author/operator difference between symptom groups revealed no significant differences. The difference between authors and operators then was not a predictor of symptom occurrence. Thus Hypothesis 5 was supported in part. Perception of work practice and the work environment did differ between authors and keyboard operators who work for them, though this was not particularly so where the operators suffers from work-related complaints.

These results indicate that authors are aware of the more tangible aspects of the keyboard operators work practice (e.g., the amount of overtime, deadlines and time spent on work duties). However, authors view the parameters relating to work

significantly more positively than do operators. The only aspects of work practice that authors viewed less positively was the adequacy of operators' training in duties. This could be interpreted to mean that authors are less satisfied with the actual work done by operators. Yet operators are more inclined to consider their training in the use of equipment as lacking. One of the particularly interesting findings is that authors are not aware of the difficulty operators feel in saying "no" to authors. This finding of course has important implications for overworking operators and suggests that not only would operators benefit from assertiveness but that authors need to recognize this source of stress on operators.

Table 10 provides a summary of the findings related to perception of the work environment as mentioned above. Variables on which operators and authors showed a significant difference of opinion, and those on which they concurred are indicated.

Table 10

Summary of Significant Author/Operator Discrepancy
on Perception of the Work Environment

FACTOR	OPERATOR/AUTHOR DISCREPANCY
Work operators do is skillful, challenging and critical	Signif.
Operators feel committ- ed to their job and take pride in their work	Signif.
Operators feel comfortable with any new technology introduced into the office	Signif.
Taking all things together operators work is stressful	Signif.
Operator's training in duties is adequate	Signif.
Operators's training in the use of equipment is adequate	Signif.
Operators are given feedback from authors about the work they do for them	Signif.
Authors have realistic expectations of operators and the work they do	Signif.
"Urgent" work given to operators by authors is always really essential	Signif.
Operators are usually consulted about and can influence decisions affecting them	Signif.
There is enough time for operators to take breaks	Signif.
Operators find it easy to say no when they want to	Signif.

Table 10 (cont.)

FACTOR	OPERATOR/AUTHOR DISCREPANCY
It is more stressful to type important documents	N.S.
Proportion of time spent on duties (e.g., keying, errands)	N.S.
Unreasonable to type the same article an unlimited number of times	N.S.
Frequency of overtime worked	N.S.
Frequency of deadlines	N.S.

Signif. denotes significant discrepancy
 N.S. denotes consensus
 (discrepancy not significant)

Both attribution and perception research questions and hypotheses have obvious implications for intervention programs. Firstly, issues of concern to operators can be identified. Secondly, as perceptions influence behaviour and therefore work practice, awareness of different perceptions of both groups may lead to better understanding and consequently improved interaction and interventions.

RESULTS RELATING TO THE MODEL

Consistent with the model developed in the Introduction, the following results pertain to hypotheses that seek to: (1) confirm existing findings about exposure factors (Hypothesis 6), (2) examine the relationship between stress health complaints (Hypotheses 7 to 10), and (3) explore uncharted relationships between psychosocial parameters relating to stress and RSI according to the model - (A) the work environment (Hypotheses 11, 12 and 13) and (B) worker characteristics (Hypotheses 14 and 15).

(1) Exposure (risk) Factors

Hypothesis 6 postulated that identifiable exposure factors would be related to the development of musculoskeletal problems. Such exposure factors were determined in the model to fall into four categories - a) physical environment, b) job-person fit, and c) work practice. The relationships between symptom occurrence and variables designed to tap such factors are described below.

a) The Physical Environment

Equipment: Subjective comfort ratings were used on a number of features of the work environment to determine if a relationship existed between subjectively determined comfort and symptom occurrence. Comfort of desk, chair and keyboard correlated significantly with symptom occurrence ($r=.184$,

$r=.193$, $r=.139$, respectively, $p<.05$). At a more psychological level, general comfort with technology showed a significant, though weak correlation with symptom occurrence ($r=.172$, $p<.02$).

Thus chairs, desks and keyboards considered to be uncomfortable are more likely to result in frequent musculoskeletal problems, as is a feeling of discomfort with new technology.

Adjustability: More specifically easily adjustable chairs and desks were significantly associated with such comfort ratings ($\chi^2=12.336$, $p<.001$ and $\chi^2=16.869$, $p<.001$). 66.7% of the No Symptom group had adjustable desks, whereas only half that proportion of RSI sufferers (36.4%) had adjustable desks. Similarly, 100% of non sufferers had easily adjustable chairs, in contrast to 91.7% of sufferers. Subjective rating of comfort therefore appears to be determined, at least in part by its easy adjustability. It might be concluded then that money spent on new equipment is justified.

Other physical features: Comfort with temperature, amount of space, lighting and attractiveness of the office were correlated with symptom occurrence to determine if a relationship was present between these features and symptom occurrence. Analysis of variance revealed no significant differences between symptom groupings on their rating of these conditions. The mean ratings are indicated below in Table 11. With 5 possible response categories, ratings ranged from

comfortable (1) to uncomfortable (5).

Table 11

Mean Operator Ratings of Features of the Physical Environment

FEATURE	MEAN RATING #	S.D.
Temperature	2.08	.94
Amount of Space	1.92	1.17
Lighting	1.80	.90
Aesthetics	2.28	1.03

1 = comfortable, 5 = uncomfortable

Although these working environment conditions were generally rated fairly positively, the means reflect the most dissatisfaction with the attractiveness of the office and temperature.

b) Job-Person Fit

The association between RSI and variables hypothesised to influence such symptoms are outlined below.

Age: In this study, age was not significantly related to frequency of symptom occurrence, nor with site of symptoms. There was, however a significant negative correlation between age and the number of other symptoms ($r = -.265$, $p < .002$). Younger operators were more likely to have more non musculoskeletal,

though work-related problems than older operators.

Years experience at keyboard : How long the operator has worked at the keyboard was demonstrated to be a better predictor of injury than age.

Analysis of variance performed on years of experience at using a keyboard revealed a significant between group difference as Table 12 illustrates. Examination of the means indicates that keyboard operators suffering musculoskeletal symptoms daily have significantly less experience at the keyboard. However, as age is not related to symptom occurrence, this result probably does not suggest sufferers are younger. What is more likely is that there is a 'culling' of operators in the early years. Those who are going to develop symptoms will do so after a few years working and then leave the keyboard area. Those who are less susceptible to injury or who have developed adaptive strategies will stay in the keyboard area longer.

Table 12

Analysis of Variance of Years Experience
at Keyboard Between Symptom Groups

SYMPTOM Group	FREQUENCY	MEAN YEARS OF EXPERIENCE	STANDARD DEVIATION
Daily	20	6.4	5.0
Weekly	35	10.4	8.4
Occasionally	15	13.5	10.6
No symptoms	35	12.6	9.2

ANALYSIS OF VARIANCE

SOURCE	D.F.	S.S.	M.S.	F RATIO	F PROB.
Between gps	3	619.14	206.38	2.79	.04 *
Within gps	101	7466.49	73.93		
TOTAL	104	8085.63			

* significant $p < .05$

Associated physical symptoms: A paper on tenosynovitis by Simpson (1980) listed a range of factors which may physically predispose an individual to develop the condition, including a past history of injury and arthritis.

In response to questions determining previous injury to back, neck, arms and hands, or a history of arthritis,

approximately a quarter of each symptom group expressed problems in at least one of these areas. No group had significantly more or less "predisposing conditions". These findings must be interpreted cautiously as sufferers may be more hesitant to report such problems if they existed as they could jeopardize compensation claims.

Training/Competency/Skill: No significant difference between symptom groups was evident in their assessment of adequacy of training in both duties and use of equipment. 82.6% of the total sample considered their training in work duties to be adequate, with 72.9% rating their equipment training as adequate.

Correlations were calculated for variables associated with skill - years spent keying, subjective feelings of competency in performing a job, assessment of the adequacy of training in duties and equipment and experience in terms of years spent keying. Years of experience at the keyboard was associated with considering equipment training to be adequate ($r = .187$, $p < .01$) while general feelings of competency in the job was related to being older ($r = .226$, $p < .005$).

A significant association between adequacy of training and type of training was evident ($\chi^2 = 10.338$, $p < .005$). Table 13 outlines the type of training received crosstabulated with rating of training adequacy. The majority of those rating their equipment training as adequate (40%) received such training on the job. Of those who found their equipment training to be inadequate, a clear majority (58.6%) had been left to 'read the manual' as the only form of training.

Table 13

Categories of Training Considered
Adequate and Inadequate by Operators

Count Row % Col %	Training Category			Row Total
	Formal	On the job	Read manual	
<u>Rating</u>	29	38	28	95
Adequate	30.5 93.5	40.0 79.2	29.5 62.2	76.6
Inadequate	2 6.9 6.5	10 34.5 20.8	17 58.6 37.8	29 23.4
Column Total	31 25.0	48 38.7	45 36.3	

c) Work Practice

Quantity of Work: As a measure of work quantity, the average number of pages requested by authors each day was calculated. Analysis of variance revealed no significant difference between symptom groups in terms of the number of pages requested by authors. The median number of pages estimated by authors was 10 pages on an average day, with a range of 1 to 40 pages.

There was no significant between group difference in terms of whether they considered their workload to be varied or not (i.e., increasing and decreasing rather than staying constant). The mean group proportion of 88.2% considered their workload to

be varied. However, a clearly smaller proportion thought this was preferable (70.8%). Although not statistically significant, this data does reinforce the need to acknowledge different individual preferences.

Deadlines: Although the RSI group had proportionately more daily and weekly deadlines than the no symptom group (64.7% and 42.1%), the difference was not statistically significant.

Time Spent Keying: There was no significant difference between symptom groups in terms of the amount of time they spend at the keyboard. Approximately half the sample (44.8%) spend between 26 and 50% of their day using a keyboard, and the most of the other operators (41.6%) spend between 76% and 100% of their time at work on the keyboard.

Recuperation: Respondents were asked several questions relating to opportunities for recuperation.

Two operator determined behaviours were significantly related to symptom occurrence. Often missing rest or meal breaks was significantly correlated with symptom occurrence ($r=.206$, $p<.001$). In addition, RSI sufferers were significantly less likely to move away from their desk and/or do "pause gymnastics" during breaks than symptom free operators ($\chi^2 = 15.67$, $p<.05$). This confirms the literature referring to not taking breaks as an exposure (risk) factors. What it does not explain is why breaks are not taken. If operators do not take breaks because they perceive externally determined obstacles are they more likely to develop RSI than those who take more personal responsibility for their well being (internal locus of control)? These questions were addressed in the following

section examining these and other parameters relating to the work environment.

c) Changes

Hypothesis 6 (c) predicted that occurrence of injury would be accounted for by such clearly identifiable changes in working conditions just prior to injury.

New Technology: Approximately twice as many RSI sufferers to nonsufferers had had new technology introduced into their work (60% and 33.3% respectively). Although these proportions reflect a trend, they were not statistically different.

Of those who reported at least one musculoskeletal symptom, 45.5% identified change in work pattern just prior to injury (see Table 14). The most frequently reported change was that of working faster (93.2%), with 80% not taking breaks and 69.7% working overtime. A change in equipment or furniture prior to developing problems was reported by 32.4%. Only small proportions reported recent long absence from work e.g., sick, recreation or maternity leave (16.3%) or promotion to higher duties (13.2%). 60.8% of those respondents reporting at least one musculoskeletal problem ($n=125$) were able to identify at least one clear change (pattern, equipment, promotion or absence) just prior to injury, suggesting a causal relationship. However, the considerable proportion of 39.2% injured operators unable to identify such changes suggests that changes alone cannot account for injury.

Table 14

Operator Identified Changes Prior to Awareness of Problems.

Nature of Change	Frequency	Base N	Percentage
Changed work Pattern	46	101	45.5
Faster	41	44	93.2
Overtime	23	33	69.7
No breaks	24	30	80.0
Change in Equipment	33	102	32.4
Absence	17	104	16.3
Promotion	14	106	13.2
At least one identifiable change	76	125	60.8

The results thus confirm Hypothesis 6 that particular exposure factors are related to the development of RSI. Each of the categories within the model (i.e., a) physical environment, b) job-person fit and c) work practice) was composed of significant risk factors.

These results achieve two further ends. Firstly, many of the variables shown in individual studies and suggested speculatively to be associated with RSI in the literature were substantiated within this single study. Secondly, because support for the existing literature was found in this study, validity is added to any significant findings related to the untested hypotheses of the present study. Table 15a and 15b

below present those findings reflecting a significant difference between sufferers and nonsufferers.

Table 15a

Summary of Results relating to between group differences on Exposure Factors

FACTOR	BETWEEN GROUP DIFFERENCE SUFFERERS AND NON-SUFFERERS
a) Physical Environment	
Comfort of - chair	Signif.
desk	Signif.
keyboard	Signif.
temperature	N.S.
lighting	N.S.
amount of space	N.S.
aesthetics	N.S.
Comfort with technology	Signif.
b) Job-Person Fit	
Age	N.S.
Years experience at keyboard	Signif.
Previous injury or condition (e.g., arthritis)	N.S.
Training/Competency/Skill	
Adequacy of duty training	N.S.
Adequacy of equipment training	N.S.
Feeling of competency	N.S.
c) Work Practice	
Deadlines	N.S.
Time spent keying	N.S.
Missing breaks	Signif.
Not moving during breaks	Signif.
Changes prior to injury	
Working faster	93.2% *
Not taking breaks	80.0% *

* only those who were injured responded questions related to changes prior to changes prior to injury. These two factors were indicated by the greatest number of injured respondents.

Table 15b

Summary of other significant relationships
between variables

Adjustability of furniture and comfort

Older age group and feelings of competency

Years of experience and adequacy of equipment training

Adequacy of training and type of training

(2) Stress and Health Complaints

Hypotheses 7 sought to determine the relationships between stress, RSI and the work environment. This hypothesis proposed that work environment, work practice and personal factors identified as stressors would be related to the development of RSI. The first part of this section relates to stress and coping more generally, followed by data establishing the associations between work factors, health complaints and stress.

Measurement of stress and coping ability in general

Several exploratory variables were designed to determine whether associations were present between stress, musculoskeletal complaints and other symptoms. Variables related to stress included assessment of how stressful they found work and nonwork to be, experience of a recent crisis, as well as self rating of their coping ability.

A significant correlation was found between assessment of work as stressful and symptom groupings ($r = .188$, $p < .01$). 52.9% of RSI sufferers found work to be moderately to extremely stressful, whereas only 27.8% of those with no symptoms found work to be similarly stressful.

Nonwork stress and coping ability

Nonwork stress: When symptom groups were correlated with assessment of stress that had nothing to do with work, similar, though even more dramatic proportions than the work stress correlations mentioned above were present (50% and 14.3%, $r = .256$, $p < .01$). Thus RSI sufferers are more likely to consider both home and work stressful.

Crises: RSI sufferers were more likely to have experienced a recent major crisis than non sufferers (25% and 11.8%), however the numbers were too small to determine significance.

Coping: A greater proportion of nonsufferers (80%) rated their coping ability more positively than did RSI sufferers (66.7%), though not significantly. In addition, symptom occurrence correlated positively with ratings of self as tense and 'worrier' ($r = .16$ and $r = .15$, $p < .05$). Those with more frequent symptoms were more likely to be tense and worriers.

Of those who considered themselves less able to cope, 30% had had a recent crisis whereas none of the no symptom group had similarly experienced a crisis in the last year.

Thus the pattern of results in a general sense support Hypothesis 7 that stress, both work and nonwork would be related to symptom development. Sufferers were more likely to have experienced a crisis and to find both work and nonwork more stressful than nonsufferers. In addition, their self-rated ability to cope with such situations was less than that reported by nonsufferers.

These finding must be interpreted with some caution. Problems at work may have contributed to extrawork crises, or nonwork crises may have contributed to stress and tension at work. The causal links with coping ability are similarly difficult to make. Ability to cope may be a consequence of the crisis and/or suffering from RSI rather than a reflection of their general or usual ability.

Specific Job attitudes, stress and symptom occurrence: In order to determine what particular work attitudes and behaviours were related to assessment of work as stressful, respondents were asked to rate several aspects of their attitude to work and work behaviour. Correlations between these factors and symptom frequency were then calculated. Table 16 outlines the results of these analyses.

Table 16

Correlations Between Work Attitude
and Stress and Symptom Occurrence

WORK ATTITUDE	WORK STRESS		SYMPTOM OCCURRENCE	
	$r=$	$p<$	$r=$	$p<$
Work requires intense attention and concentration	.258	(.00) *	.197	(.01) *
Never seem to get on top of work	.307	(.00) *	.043	(.31)
Describe self as a "workaholic"	.028	(.38)	.148	(.05) *
Feel uncomfortable with new office technology	.079	(.18)	.173	(.02) *
Often have to push self to work harder and faster	.321	(.00) *	.150	(.03) *
Don't feel committed to job	.240	(.00) *	.059	(.25)
Don't find work challenging, critical and skillful	.187	(.01) *	.007	(.47)
Don't feel competent in performing tasks associated with job	.212	(.00) *	.078	(.18)
Feel have to compete with other operators	.169	(.02) *	.167	(.02) *
Concerned about security of job	.003	(.47)	.003	(.49)
Find work boring	-.014	(.86)	.107	(.24)

* denotes significance at $p<.05$

Table 16 indicates that work requiring intense concentration, and feelings of: never seeming to get on top of work, often having to push oneself to work harder and faster, not feeling committed to the job, not finding work challenging, critical and skillful, not feeling competent in performing tasks associated with the job and feeling a need to compete with other operators are related to finding work stressful. Of these factors, work requiring intense attention and concentration, often having to push self to work harder and faster and feeling a need to compete with other operators were also related to having RSI. Thus psychological items related to feeling stressed at work also appear to be related to work injury. In addition, other psychological work attitudes, not necessarily stress related were also shown to be related to symptom occurrence. Self-description of workaholic and discomfort with new technology were also significantly related to injury, though not to feeling stressed at work.

The findings in Table 16 support the existing literature identifying stress in the work environment. In addition several of those factors related to stress in this sample are also correlated with occurrence of musculoskeletal complaints. Job insecurity and boredom, factors often cited in the American and European literature as stressors did not evidence significant associations with stress or musculoskeletal complaint. However, support is found in this study for the hypothesis that important work stress parameters are associated with the development of symptoms.

As a further parameter relating to stress, Hypothesis 8 postulated that the number of health complaints would be related to stress.

In addition, Hypothesis 9 proposed that operators with more frequent symptoms or RSI would be more likely to suffer from more health complaints. This hypothesis was examined in terms of both musculoskeletal complaints and nonmusculoskeletal complaints.

Number of Health Complaints and Stress

Number of Musculoskeletal Problems and stress: Both perception of work and nonwork as "moderately" to "extremely stressful" related to a greater number of musculoskeletal symptoms. Respondents who found work and nonwork stressful had a greater mean number of musculoskeletal symptoms (2.21 and 2.18 respectively) than those who found work and nonwork unstressful (1.74 and 1.76). t test values indicating the significance of difference in number of musculoskeletal symptoms were $t=2.75$, $p<.01$ for work stress and $t=2.44$, $p<.02$ for nonwork stress.

Nonmusculoskeletal symptoms and stress: A comparison of the mean number of nonmusculoskeletal symptoms between those who found work "a little" to "not at all stressful" and those who found work to be "moderately" to "extremely stressful" revealed similarly significant differences ($M=2.14$ and $M=1.45$, $t=2.32$, $p<.02$).

This contrast appeared even more significant when the stress has nothing to do with work ($\bar{M}=2.3$ and $\bar{M}=1.3$, $t=3.32$, $p<.001$).

Thus RSI sufferers and those who find work and nonwork stressful are more likely to experience significantly more work-related, musculoskeletal and nonmusculoskeletal symptoms than those who do not consider themselves stressed. Thus Hypothesis 8 is clearly supported, with the number of health complaints related to stress. Such findings can be interpreted in several ways. RSI sufferers and those who find life stressful are more sensitive to their own health problems and more likely to complain of problems than nonsufferers or unstressed operators. Another explanation is that having RSI and/or feeling stressed lowers the body's tolerance to health problems.

As with many of the relationships discussed and to be discussed, a systems interpretation may be the most appropriate. Stress and its components may have both a cause and an effect relationship with RSI.

Nonmusculoskeletal symptoms and RSI

More specifically than the number of reported health complaints, analysis of the nature of non-musculoskeletal health complaints was analysed to test Hypothesis 9. Hypothesis 9 proposed that RSI sufferers would be more likely to suffer from other work-related health complaints. Of those who complained of other symptoms, the most frequently reported problems were eyestrain (54.9%), headaches (43.8), loss of concentration (27.1%) and blurred vision, difficulty in reading (24.3%). The mean number of non-musculoskeletal symptoms reported by operators was 1.9 symptoms (S.D. = 1.8). A very high proportion of the total number of respondents (86.8%) complained of at least one non-musculoskeletal symptom. These results are presented in Table 17.

Table 17

Other Health-Related Problems

NATURE OF PROBLEM	FREQUENCY	PERCENTAGE
Eyestrain	79	54.9
Headaches	63	43.8
Loss of concentration	39	27.1
Blurred vision, difficultly reading	35	24.3
Loss of appetite	12	8.3
Dizziness	12	8.3
Skin Rash	8	5.6
Other problems	11	7.6

Mean Number of non-
musculoskeletal
complaints

$\bar{M} = 1.9$ $S.D. = 1.8$

Proportion of total
complaining of at
least one non-
musculoskeletal
problem

86.8% ($n = 125$)

Analysis of variance was carried out to determine whether those with RSI were more likely to suffer from more non-musculoskeletal problems than the no symptom group. Significant between group differences were revealed ($F=2.73$, $p<.04$). RSI sufferers were more likely to suffer from more other symptoms ($\bar{M} = 2.17$) in addition to RSI than those without

musculoskeletal problems ($\bar{M} = 1.1$). There was no significant between group difference in terms of the nature of complaints. Thus support for Hypothesis 9 and 10 was not present. However, some interesting trends were related to headaches.

Although not statistically significant, a greater proportion of RSI sufferers complained of headaches (56.5%) than those with no musculoskeletal symptoms (39.3%). As the medical literature relates headaches to physiological tension, this result lends some support to the suggestion that RSI sufferers are more tense. Reinforcing this proposal, a significant relationship was found when self rating 'tense' was correlated with symptom occurrence ($r = .16$, $p < .03$). Once again a systems interpretation is more appropriate than attempting to suggest direct cause and effect. Headaches and related tension may both cause and be the result of RSI.

Table 18 summarises the findings in this section. Presented are those factors related to stress which distinguish sufferers from non-sufferers.

(3) Psychosocial Parameters relating to

A : The Work Environment

Several psychosocial parameters relating to the work environment were hypothesised to be associated with RSI. The two major issues covered were a) Locus of Control and b) Author/Operator interaction.

a) Locus of Control

Hypothesis 11 considered that sufferers would be more likely to perceive an external locus of control than nonsufferers. Three contexts were designed to test the first part of the hypothesis that suggested operators would view author and/or organizational factors rather than personal motivations as reasons for:

i) not taking breaks, ii) taking on extra work, and iii) the increased incidence of RSI. This third aspect has been discussed under attribution. A second part of this hypothesis examined operators' perception of control over work and input into decision affecting them.

1) Not Taking Breaks : One of the contexts designed to examine the locus of control hypothesis was to determine the reasons given by operators for not taking breaks when they could.

A number of work environment factors already discussed may directly relate to reduced opportunity for recuperation (e.g.

Table 18

Stress Factors which Distinguish
RSI Sufferers from Non-Sufferers

FACTOR	DIFFERENCE BETWEEN SUFFERERS AND NON-SUFFERERS
Stress	
# Work stress	Signif.
Non-work stress	Signif.
* Tense	Signif.
* Worrier	Signif.
Crises	Trend
Coping ability	Trend
Work attitude	
Work requires intense	
* attention and	
concentration	Signif.
* "Workaholic"	Signif.
Uncomfortable with	
* new technology	Signif.
Often have to push	
* self harder and faster	Signif.
Feel have to compete	
* with other operators	Signif.
Number of health complaints	
* Musculoskeletal	Signif.
* Non-musculoskeletal	Signif.
Vision problems	Trend
Headaches	Trend

* also significantly related
to finding work stressful (#).

insufficient rest time, working overtime and over lunch). However, the reasons expressed by operators themselves as obstacles to healthy work practice are important. In addition it is salient to determine if these reasons distinguish RSI sufferers from non-sufferers.

To the question "If you do not take breaks when you could, is it usually because of any of these reasons?" eleven responses were possible. The responses were categorized into three classifications, Operator characteristics, Organization determined factors (including hardware) and Author determined conditions.

Total sample and group proportions are presented in Table 19. Chi-squared tests were calculated to determine whether symptoms groups differed on each item.

The two most frequently given reasons for not taking breaks were related to individuals' characteristics. Both concern not to lose train of thought (71.1%) and enjoyment using the keyboard, not noticing the need to break (58.3%) had the greatest number of respondents considering these items as personally applicable. In addition, on a separate question, asking "Which is the most applicable reason?", both reasons were affirmed by the greatest number (27.5% and 22.0%). No significant between symptom group difference was found on these or other individual or organizational factors. However, the items on which symptom groups significantly differed were those related to author influence. Responses to the statements

"Concern about being criticised by authors for breaking" and "feeling I would be asked to do more as soon as I stop" both revealed significant chi-squared statistics ($\chi^2=13.3$, $\chi^2=1.78$, $p<.05$).

Thus, although operators as a group do not take breaks when they could for reasons related to the way they carry out their own work, those suffering from RSI are more likely to externalize responsibility to authors than are nonsufferers thereby supporting the first part of Hypothesis 11. At least two interpretations are possible. Authors of RSI sufferers are more demanding and critical. Another interpretation is that sufferers are less assertive in taking care of their own wellbeing. Both explanations may of course be the case.

Table 19

Reasons Indicated by Operators for Not Taking Breaks

CATEGORY	REASON	TOTAL % AGREEING	% RSI	%NO SYMP	<u>X2</u>
Personal	Lose train of thought	71.1 #	53.8	73.3	6.27
	Enjoy to keep on going	58.3 #	35.7	53.3	5.63
	Seems lazy to stop	19.8	16.7	40.0	4.93
Author	Asked to do more when stop	24.5	57.1	7.7	10.78 *
	Criticism	16.3	46.2	14.3	13.30 *
	To stop only means more work later	37.0	61.5	30.8	4.53
Org/Hdwr	Concern about "losing" work	3.1	0.0	7.7	1.69
	More effort to log off and on	10.2	7.7	7.1	1.50
	Need to protect keybd and access to it	9.1	9.1	7.1	.77
Org/Soc	Others operators not breaking	35.6	35.7	50.0	5.27
	No Relief available	22.9	41.7	8.3	4.76

* denotes significance at $p < .05$

stated as most applicable

11) Taking on extra work

Although the RSI group and the symptom free group had statistically equivalent distributions in relation to working overtime, a much greater proportion of RSI sufferers worked over lunch than did nonsufferers (43.8% and 22.2%), though the difference was not statistically significant.

A more specific question was designed to examine why operators took on extra work. Those who admitted to resisting saying no to extra requests of work, were asked to indicate why they did so from a list of eight items. Analysis of this question divided into operator centred reasons and author centred reasons. It is also worth reiterating at this point that operators find it significantly more difficult to say "no" to authors' requests to do extra work than authors realize ($t=2.37$, 72 df, $p<.02$).

Approximately equal proportions across each symptom group ($M=47.9\%$) agreed to taking on extra work. Of these, the most frequently given reason was that of not wanting to let the author down (87.3%), followed by the more personal reasons of concern to keep "good worker" reputation (73.7%) and feeling guilty saying no (64.6%). Symptom groups did not differ significantly on any item. RSI sufferers and nonsufferers expressed the same motivations for taking on extra work. The most frequently cited reason being external and work related, though the other popular personal reasons related in some sense to powerlessness.

This measure of locus of control did not serve to support Hypothesis 11a that operators would view author rather than personal motivations as reasons for taking on extra work.

Control and Input: The second part of Hypothesis 11 posited that sufferers would be less likely to feel they had control over their work or input into decision affecting them. Although most operators felt they were definitely not consulted about departmental decisions affecting them (42% responded 'definitely false' "I am usually consulted about departmental decisions affecting me"), of those who felt they could influence decisions to some extent, there was a greater representation, though not significant, of nonsufferers than sufferers (14.3 and 4.8). Thus, even though most operators consider they lack control over their working environment, it is nonsufferers who are more likely to feel a sense of control than sufferers. These measures of locus of control did not significantly support Hypothesis 11.

At a more general level, of those operators who had had new technology introduced into their work, only 27.1% had been involved in job redesign. These findings reinforce the anecdotal comments about powerlessness, suggesting that industrial democracy is still not being implemented within the keyboard structures.

b) Author/Operator Interaction

Expectations of Work Norms: Hypothesis 12 posited that there would be a discrepancy between authors and operators in terms of expectations of work norms. As a measure of this work environment parameter, both operators and authors were asked to specify the number of times they felt it was reasonable to be asked to retype particular types of documents. The document classifications ranged from low importance to very important. In addition, they were asked how often this number was exceeded. Table 20 presents the mean number of retypes considered reasonable for the two major classifications - low importance and very important documents - across the symptom occurrence groups. RSI sufferers appear to be both more generous in their expectation of what is reasonable and yet that more generous expectation is exceeded daily or weekly. However, despite the interesting trend indicated, no statistically significant difference was present between symptom groups.

Significant differences did exist however between authors and operators when two-tailed t tests were calculated for mean number of retypes thought reasonable. Authors' consideration of what is a reasonable number of retypes significantly exceeded that thought reasonable by operators for important documents. Operators considered 2.9 retypes reasonable, whereas authors, on average considered 11.6 reasonable, with a number saying it was reasonable to expect operators to retype an important document an infinite number of times.

Table 20

Number of Retypes Considered Reasonable
by Operators and Authors and Proportions
for Which This is Exceeded Regularly
(daily or weekly)

DOCUMENT Importance	SYMPTOM GROUPS			CLASSIFICATION		
	RSI	No syptoms	t	Opertr	Author	t
Low importance						
Retype Mean	2.1	1.5	12.08*	2.09	2.13	(NS)
% exceeded daily or weekly	70	46.2		34.1	12.5	
Very important						
Retype Mean	2.3	2.4	(NS)	2.93	11.57	2.13 *
% exceeded daily or weekly	81.9	63.2		60.2	24.3	

* denotes significance at $p < .05$
(NS) not statistically significant

Examination of the data in Table 20 relating to how frequently the reasonable number of retypes was exceeded, pointed out interesting patterns. For both types of documents, almost three times more operators than authors felt that what they considered reasonable was exceeded on a daily or weekly basis. Thus for documents of low importance, even with authors and operators agreeing on what is a reasonable number of retypes, authors are three times less likely than operators to believe this number is exceeded regularly. Although the 'exceed' pattern is similar for important documents, the same

Interpretation can not be made as the number of retypes thought to be reasonable differs so significantly. The pattern that emerges from this data is that authors clearly frequently exceed the number of requests for retypes thought to be reasonable by operators, whether the document is important or not. As a measure of work norm discrepancy, these results support Hypothesis 12.

Author Practices and Working Style: Hypothesis 13 proposed that particular author practices or working styles would be related to perception of the working environment as stressful and/or the occurrence of musculoskeletal symptoms in their operators. Several measures were created to test aspects of this hypothesis: i) perceived 'urgency' of work and realistic expectations, ii) author encouragement of healthy work practice, iii) author behaviour, iv) author working style. The results of analyses related to these aspects are outlined below:

i) Perceived Urgency of Work and Realistic Expectations :
A group of variables used to specify the nature of work pressure as a work environment parameter related to author/operator interaction examined operators' ratings of a) how essential they believed urgent work to really be as well as b) how realistic they thought author expectations were of them and their work.

On these less tangible items, rated from 'definitely true' to 'definitely false', when RSI sufferers were compared with nonsufferers, those with RSI considered it less true that their

authors had realistic expectations of them and the work they did, and considered urgent work to be less "really essential" than was thought by non sufferers. Analysis of variance revealed that this between symptom group difference was not significant.

However, when author and operator responses were compared on both items (expectations and urgent work), significant differences were evident. Using two-tailed t tests, authors rated these statements referring to realistic expectations and the "essentialness" of urgent work as significantly more "definitely true" than was rated by operators ($t = 6.96$ and $t = 5.62$, $p < .05$). Thus authors believe their expectations of operators are more realistic than operators consider them to be. In addition, authors judge urgent work as essential more than operators think it to be.

ii) Author Encouragement of Healthy Work Practice : An author determined factor influencing recuperation was also significantly related to occurrence of RSI. A greater proportion of symptom free operators have authors who actively encourage them to take breaks (58.8%) compared with only 25.0% of RSI sufferers having similarly encouraging authors. Also related to authors was the concern expressed by 45.5% of all keyboard operators that authors would criticise them for taking rest breaks. The proportions expressing such concern were essentially equal across all groups.

111) Author Behaviour : A work pressure often identified by operators, though not expressed in the literature was that of having authors standing or sitting next to them while they complete work. A significantly greater number of RSI sufferers had authors who stayed next to them while they completed work than did non sufferers (80% and 30.8%, $\chi^2 = 12.238$, $p < .02$). Authors differed significantly from their operators in their perception of whether they stood over operators. 41% of operators considered authors to stood/sat next to them sometimes when completing work, whereas only 24% of authors believed they did so. Although fewer authors recognized that operators might object to this practice (32.7%) than operators who expressed that they did mind (44.4%), the difference was not statistically significant.

Author Working Style: The overall modal responses indicated that operators considered their authors to be supportive and considerate, though demanding and authoritative. Those who found their bosses to be inconsiderate and demanding also rated their work as moderately to extremely stressful ($\chi^2 = 9.295$, $p < .05$ and $\chi^2 = 11.676$, $p < .05$). Interestingly, operators and authors concurred in their assessments of author working style on each characteristic except that of demanding. Author ratings of themselves indicated that authors thought themselves to be significantly more demanding than operators perceived them to be ($t = 3.44$, 64df, $p < .001$).

In terms of specific work style, the statement 'I am always given feedback about work I do for authors' was rated as more true for nonsufferers (53%) than for RSI sufferers (21%), though the difference was not significant. What was significant was the relationship between finding work to be stressful and the amount of feedback given ($r = -.1467$, $p < .05$). Thus lack of feedback is associated with considering work to be stressful.

The data indicate, as predicted in Hypothesis 13 that particular author practices and working styles would be related to perception of the work environment as stressful and/or the occurrence of musculoskeletal symptoms in operators.

Thus clearly aspects of authors' relationships with their operators do significantly relate to injury and/or a sense of being stressed at work. Authors therefore must be considered in any intervention strategy as the influence of their expectations, behaviour and personal style operators has been shown to significantly relate to operator stress and injury.

Table 21 summarizes the results referring to work environment psychosocial parameters that relate to RSI. The three contrasts are indicated, i.e., on variables which indicate differences between a) sufferers and nonsufferers, b) authors and operators, and c) the authors and operators with RSI.

Table 21

Summary of Work Environment Psychosocial Parameters
on which the Three Major Contrasts were Compared

SIGNIFICANCE OF DIFFERENCE	RSI AND NON-RSI	AUTHORS AND OPERATORS	AUTHORS AND RSI
Significant	Reasons for not taking breaks: a) asked to do more b) fear author criticism	Author style: Demanding	Author expectations Urgent work Encouraging taking breaks Authors standing over operators
Trend	Working over lunch Control Involvement No. retypes reasonable Amount feedback from authors	Operators mind being stood over	No. retypes reasonable Frequency retypes exceeded
Not Significant	Reasons for taking on extra work	Author style: Supportive Considerate Authoritative	

(3) Psychosocial parameters relating to

B : Worker Characteristics

Hypothesis 14 considered that sufferers could be characterized by particular personal factors. These factors took the general headings of a) demographic descriptions, b) self rated psychological characteristics, c) health habits and d) extrawork activities that are repetitive and straining. Outlined below is the data pertaining to this hypothesis.

a) Demographic and Health Descriptions

Marital status and number of children : In this sample, non sufferers were more likely to be married (70%) and have children (50%) than those with RSI (45.5% and 36.4%). However, neither marital status nor number of children were not significantly related to symptom occurrence.

b) Self Descriptions

Correlations were calculated to determine if relationships existed between symptom occurrence and self descriptions of personality. Self descriptions of 'tense' and 'worrier' were both positively related to frequently occurring musculoskeletal symptoms. The description of 'workaholic' was negatively related to symptom occurrence. Table 12 illustrates the correlations obtained between self descriptions and symptom occurrence:

Table 22

Correlations between symptom occurrence
and self rated personal characteristics

CHARACTERISTIC	r	$p<$
Tense	.16	.03 *
Worrier	.15	.05 *
"Workaholic"	-.15	.05 *

* denotes significance at $p<.05$

A further correlation was calculated to determine whether an association was present between feeling committed to work and self description of 'workaholic'. A significant relationship was present ($r=.22$, $p<.01$). Those who considered themselves 'workaholics' were also committed to their work.

Thus, operators with more severe musculoskeletal problems are more likely to be tense and worrying types. Whereas those who are symptom free are more likely to be more conscientious workers. Interestingly, neither commitment, nor self description of 'workaholic' were related to a need to push oneself or finding it "difficult to say no", suggesting that the conscientiousness was neither forced nor due to a lack of assertiveness.

c) Health Habits

Smoking: A result with important implications is the relationship found between smoking and RSI. Respondents were asked whether they smoked and how many cigarettes they would smoke each day. A clear association existed between smokers and diagnosed RSI sufferers ($\chi^2 = 4.14$, $p < .05$). 62.5% of RSI sufferers smoked, in contrast to the 27.8% of non sufferers. As smoking has been shown in the medical literature to contract the blood vessels, thereby reducing the supply of blood to the peripherals, the association between smoking and RSI is further bolstered by the finding by Welch (1973) that deficiencies in peripheral circulation were related to fatigue and subsequent strain in the wrist. However, it could also be argued that smoking may be a response to injury as a method of coping with pain or injury. Even if this is so, Welch's findings would suggest that smoking may exacerbate any health complaint of the peripherals by reducing the blood supply and therefore also nutrients.

Level of fitness: Exercise demonstrated a very interesting relationship with site of injury. Respondents were asked a) what type of regular exercise they did, b) how often and c) for how long each time. Those that met the criteria of at least twice a week for at least fifteen minutes (15) each time were classified as regular exercisers. Almost equal proportions of the total number of respondents exercised and didn't exercise regularly (49.6% and 50.4%). For those who did exercise regularly, the most popular forms were exercise classes (26.5%),

walking (22.1%) and swimming or jogging (20.6%).

In this study although no significant association was found between exercise and symptoms occurrence or injury to the peripherals (arms, hands, wrists or fingers), not exercising was strongly related to upper body symptoms ($r=.305$, $p<.005$). This result suggests that regular exercise may help reduce the likelihood of upper body problems.

Relaxation: 51 (35.4%) of the total number of respondents did some form of regular relaxation (at least twice a week). There was however, no significant difference between symptom groupings on this variable.

Inadequate sleep (less than 6 hours or unsatisfying sleep) was significantly related to symptom occurrence ($r=.15$, $p<.05$). This could again be interpreted as catalysing or exacerbating musculoskeletal complaints as this important opportunity for recuperation is not present. Pain may also keep sufferers awake.

Coffee consumption: Consumption of coffee was not related to symptom occurrence.

d) Other Extrawork Activities

Time spent at hobbies such as knitting, playing a musical instrument, playing video games, crocheting and others were found to be unrelated to the development of symptoms in keyboard

operators.

Thus Hypothesis 14 was, in part, confirmed. Two of the four measures hypothesized to be related to the development of musculoskeletal symptoms were support. Demographic characteristics and extrawork activities tested in this study were shown to be not significantly related to the development of musculoskeletal symptoms, with particular self-rated psychological descriptions and health habits demonstrating significant relationships.

Table 23 presents a summary of those personal psychosocial parameters indicating significant differences, trends and no significant differences between sufferers and non-sufferers.

Table 23

Summary of Personal Characteristics Positively
Related to Musculoskeletal Complaints

FACTOR	BETWEEN GROUP DIFFERENCE
Tense	Signif.
Worrier	Signif.
Non-"Workaholic"	Signif.
Smoking	Signif.
Exercise	Signif.
Sleep	Signif.
Married	Trend
Children	Trend
Relaxation	N.S.
Coffee consumption	N.S.
Extrawork activities	N.S.

OTHER RESEARCH ISSUES

Factors discouraging reporting of symptoms

Early reporting of symptoms has been noted in most recommendations as an essential preventative action. When injury is discovered in its initial stages the prognosis is extremely positive with the appropriate changes to working conditions made (e.g. reduced keying). However, operators do

not always report symptoms. Reasons for not reporting work related symptoms and the proportion of respondents identifying with that reason (non exclusively) are presented in Table 24.

Table 24

Reasons for Not Reporting Work Related Symptoms

REASON	FREQUENCY	PERCENTAGE
Nobody would listen	2	1.6
Can't believe I would get injured from work	13	9.9
Wouldn't want redeployment	3	2.3
Skeptical reactions from others	33	26.0
For economic reasons, can't afford to be put off work	33	25.8
Wouldn't want to be labelled as having RSI	38	26.3

Thus stigma and practical considerations appear to be the major barriers considered by operators themselves for not reporting injury. Such a concern with being labelled may well be justified as this reason had the greatest representation of those actually diagnosed as having RSI (50%). In terms of the prominence given in recommendations (e.g., RSI Task Force, 1985) to early reporting for a positive prognosis, this question clearly reflects a need for further investigation.

Age and tolerance of physical conditions

Testing of McPhee's assertion that age related to a decreased tolerance to working conditions, revealed no significant relationship between age and comfort ratings. On eight physical conditions - desk, chair, keyboard, light, temperature, air 'quality', amount of space and aesthetics - Older workers' comfort ratings did not differ from those of younger workers. This could be explained by more satisfactory physical conditions in this sample.

Descriptive data on age, experience
and site for each symptom grouping

The following results describe particular aspects of work and health as they relate only to those who report musculoskeletal problems.

Most Common Site

The most frequently reported problem site for all respondents suffering any musculoskeletal problems was the neck (22.3%) followed by wrists (18.0%), back (16.5%) and shoulder (15.0%). These findings are interesting given that the focus of most Australian literature is on the hands and wrists. Most of the European, Scandinavian and Japanese literature reports more on these upper body sites (see e.g., Grandjean, 1982; Luopajarvi, 1984; Maeda, 1980).

When site of complaint was crosstabulated with age and years spent using a keyboard, the same proportions consistently resulted. Approximately half the reported problems were in the neck, back and shoulders and half in the hands, finger, wrists and arms. Thus neither age nor years spent using a keyboard are significantly related to the site of problems. However, the following data do reflect some interesting trends.

Experience at keyboard and Site: Of all respondents suffering any musculoskeletal symptoms, those who had worked on keyboards for less than four (4) years predominantly reported wrist problems (29%). Between five (5) and ten years (10) at the keyboard appeared to lead to back and shoulder problems for 38.5% of respondents in that category. 19.6% of sufferers with eleven to nineteen years' experience tended to suffer from neck pain. Respondents who had spent more than 20 years at the keyboard were most likely to experience neck problems.

Table 25 outlines some descriptive details about the major symptom grouping used in analyses. Modal statistics are given. Only experience at the keyboard, however, had a significant association with symptom grouping as mentioned earlier.

Table 25

Modal Responses for Major Symptom Groups

SYMPTOM GROUPING	AGE	EXPERIENCE AT * KEYBOARD (Yrs)	SITE	
RSI	Under 25yrs	0 - 4 (43.5%)	wrists	(50.0%)
Daily	20 - 35 yrs	0 - 4 (33.3%)	neck	(47.2%)
Weekly	31 - 35 yrs	0 - 4 (31.2%)	neck	(56.3%)
			wrists	(33.3%)
		11 -19 (31.2%)	shoulder	(33.3%)
Occas.	36 - 40 yrs	0 - 4 (33.3%)	neck	(23.9%)
		11 -19 (30.6%)	wrists	(22.4%)
			shoulder	(20.9%)

* significant association with symptom grouping

RELIEF OF SYMPTOMS

Almost half of those who suffered symptoms found no relief (45.7%), irrespective of the site or frequency of musculoskeletal complaint. Of those who found relief, the majority found reducing or eliminating keying (47.06% and 19.6%) gave the most relief, with 13.7% gaining relief from changing their job or equipment. Other forms of relief included receiving stress counselling ($\underline{n}=2$), massage ($\underline{n}=2$), chiropractic assistance ($\underline{n}=1$), relaxation therapies ($\underline{n}=2$) and physiotherapy ($\underline{n}=1$).

TEST OF OVERALL MODEL

Finally, the extent to which an overall model, embodying significant predictors (personal characteristics, organizational features and aspects of author/operator interaction), had utility in the prediction of symptom occurrence was assessed with multiple regression analysis. All of the independent variables with significant zero-order correlations, and the significant interaction terms, were entered into the equation to establish the amount of variance that could be explained in symptom occurrence by the chosen variables. The standardised beta coefficients, multiple R and adjusted R^2 are reported in Table 26. Inspection of this table revealed that almost 70% of the variance in symptom occurrence can be accounted for by the chosen variables. Four of the variables emerged as particularly significant predictors of symptom occurrence - the strongest being the two self-rated characteristics (submissiveness and competitiveness) and two organizational features (deadlines and adequate provision of rest breaks). Also included in the model was a variable related to author/operator interaction, that of operators strong belief that work considered "urgent" by authors is not really essential.

These findings thus further reinforce the validity of the proposed model because of the inclusion of exposure factors (not enough time to take rest breaks and frequent deadlines) as well as the two contexts of psychosocial parameters relating to a) the work environment (author/operator interaction variable) and b) worker characteristics (competitiveness and submissiveness).

In addition, as mentioned earlier, strength is given to the new hypotheses relating to the influence of psychosocial parameters as this study confirms previously identified risk factors.

Table 26

Regression Analysis

Variable	Standardized partial regression coefficient (β)
Competitive in performing work	.627 *
Submissive	.488 *
Not enough time to take rest breaks	.413 *
Introverted	.386 *
Frequent deadlines	.346 *
Perfectionist	-.274 *
Belief that urgent work is not really essential	.250 #
Multiple R	.82
R square	.68
Adjusted R square	.61
Standard Error	.88

* significant at $p < .01$

significant at $p < .02$

CHAPTER 5

DISCUSSION

This study was primarily designed to investigate the influence of psychosocial parameters on keyboard operators and musculoskeletal health complaints. Multiple issues raised separately by previous research and speculation were integrated in this single sample. Furthermore, issues which have not been discussed in the literature were explored in the present investigation, with original measures developed to test them. This study thus contributes to the existing body of literature by providing both support for previous research and speculation, pointing out new issues and suggesting future lines of inquiry as well as providing new measures for testing such issues. This study clearly points to the multicausal nature of the problem of musculoskeletal complaints in keyboard operators. Despite the complexities inherent in such a multicausal problem, a model proposed in this study was supported by the findings.

ATTRIBUTION

The first aim of this study was to examine how authors and operators attributed the causes of RSI. There was both discrepancy and consensus of opinion between authors and keyboard operators on the importance attributed to several causal influences. Both groups were mutually aware of the influence of the well publicized risk factors of operators not taking breaks, having many deadlines and the quantity of work on increasing the incidence of RSI. In addition the hardware factor that has

attracted much attention in the workplace, namely the keyboard - was viewed as important by both groups.

In this sample awareness of the causal influence of deadlines and quantity of work was reflected in the fact that neither of these two author determined variables was in fact associated with injury. However, authors' lack of awareness of the importance operators attribute to typing too fast, authors' expectations and attitudes, not having control over their work and not reporting symptoms suggests that authors may be less prepared to acknowledge (or are unaware of the importance of) the less tangible influence of psychosocial influences that operators see as important. Although authors recognize some of the more obvious factors believed to constitute risk, they appear to be less willing to see their role in determining that risk. In fact, on the two factors on which this discrepancy of opinion is present (not having control and authors' expectations), there is a greater likelihood of that operator suffering from musculoskeletal complaints. Conversely, when an author and his operator agreed on the importance of these items, operators were less likely to suffer symptoms.

Overall, operators rated all factors as more important causal influences than did authors, except for the psychological characteristics related to operators. On these variables (personality and work ethic) authors attributed more significance than operators. Support was thus lent to the hypothesis that both authors and operators would tend to view external causes rather than more personally determined factors as causal,

reinforcing the proposed extension of Kelky (1967) and Nisbett and others' (1971) argument. Obviously external organizational changes are more feasible to make than individual changes and thus external factors have been the focus of publicity. These results then are perhaps testament to the effectiveness of publicity on RSI.

These opinions were of course in the abstract, however they do suggest the need for both groups to become more aware of each others' opinions. As the NOHSC report (1985) points out, opinions do influence behaviour and the effectiveness of intervention strategies.

PERCEPTIONS OF WORK PRACTICE AND THE WORK ENVIRONMENT

At a less abstract level, questions related to how each group actually perceived the work environment of keyboard operators were investigated. In addition it was also determined whether negative perceptions and/or discrepancies of perception between authors and operators predicted symptom occurrence.

Authors' view of the psychosocial aspects of operators' work situation is generally more positive than operators consider it to be (e.g., little stressed, more challenging, enough time for breaks, control over work). This is particularly so in terms of authors' own role in that environment (e.g., amount of feedback given, realistic expectations, ease of "saying no" to author requests). Such socially desirable responses could be expected, but they once again reflect a lack of willingness to

acknowledge, or perhaps an honest lack of awareness that operators perceive these conditions more negatively.

The two less positive aspects of the work environment which more authors than operators agreed with was the boring nature of the job and the lack of adequate duty training. Thus even though authors considered operators' working situation to be generally more positive than operators considered it to be, they judge it to be boring. In addition, it would appear that authors are not particularly satisfied with the outcome as they perceived operators' duty training as less than adequate.

On the more quantitative aspects of work practice, authors agreed with their operators' estimations of the number of deadlines set, requests to work overtime and the amount of time operators spent carrying out their various duties (e.g., keying, filing). These factors were also attributed by both as important causal factors as mentioned earlier.

Thus the consensus on quantitative aspects of the work environment, particularly on those factors recognized in the literature as risk factors (deadlines, working overtime, amount of keying) reflects a realistic awareness by authors, at least when queried, of what is actually occurring. However, in terms of the more psychosocial aspects of the work environment conditions (e.g., the control operators have over their work, the stress involved in keyboard work) they either lack awareness or are unwilling to acknowledge the less than desirable conditions. Yet it is these factors which have significant relationships

with the occurrence of injury in addition to the more quantitative exposure aspects. How authors attribute cause is then also reflected in their perception of what is actually occurring in the work environment. The lack of preparedness to view factors influenced in large part by their own attitudes and behaviours as important is mirrored by a lack of awareness of how those factors are perceived by operators.

THE MODEL

(1) Exposure (risk) factors

Support was obtained for a number of risk factors mentioned in the literature. Although age was not found to be a predictor of injury, experience at the keyboard did have a significant relationship with injury. Less experienced operators were more likely to suffer injury. This suggests that those who remained in the keyboard area had developed more adaptive strategies, and/or those who develop problems after a short time were likely to leave keyboard work.

Biomechanical features of the physical environment were related to occurrence of symptoms (chairs, desks and keyboards) in terms of perceived comfort and adjustability in the expected direction, confirming many previous studies (e.g., Ferguson, 1971; Grandjean, 1982; Taylor et al., 1979). However more peripheral aspects such as amount of space, temperature and lighting suggested by McPhee (1980) were not significantly related to injury. This may have been because these features were of a

satisfactory standard or they are unimportant variables.

Two other more conventionally used measures of exposure, frequency of deadlines and amount of time spent keying (Maeda, 1982; Ryan et al., 1984) did not significantly relate to injury in this sample. However, of those who were injured, most (93.8% and 80.0%) identified faster typing and not taking breaks as changes occurring in their working pattern prior to injury.

Recuperation parameters were significant predictors with missed breaks (Maeda, 1982) and not moving or exercising during breaks, a factor not discussed in the literature, significantly related to injury. Even though operators acknowledged the importance of taking breaks, it appeared that they did not put that awareness into practice. Although the concept of individual operators breaking from their keying work as they feel the need for refreshment is ideal, the present research points to significant problems related to this. Firstly is the concern expressed by operators that they will be criticised for breaking, particularly by authors. Secondly, they appear to either fall into the "willing horse" syndrome, wanting to please even at the cost of injury, or place responsibility for not taking preventative action on external factors.

Humane and satisfying workplaces should facilitate individuals to take responsibility for their own work. However, the findings of this study suggest that psychosocial factors rather than organizational features present obstacles to realizing this goal. It appears that those at all levels in the

workplace who have direct and indirect contact with operators would benefit from being made aware of their contribution to a less stressful work environment as well as a need to educate operators in taking personal responsibility for their own health.

An obvious obstacle to prevention accruing from increased awareness and responsibility is the nature of the distribution of power in the keyboard operators' work environment. Many submissions to the Task Force inquiry into RSI in the Australian Public Service, as well as comments written on questionnaires in this survey referred to the powerlessness of keyboard operators, both real and perceived. Increased autonomy is more fundamentally needed as a basis for other remedial changes to be realized. As the Task Force mentions (1985, p. 237), "The devolution of authority and responsibility, and widening of matters in which they may be exercised, means that decision can more often be taken by those whose interest in and knowledge of the matters in question are greatest."

(2) Stress and health complaints

What readily becomes evident from the data is that not only are obvious exposure (risk) factors associated with injury - in particular those relating to work practice and changes to work practice - but less tangible psychosocial parameters that relate to stress are equally important.

In a general sense, those perceiving both work and nonwork as stressful were more likely to suffer from a greater number of work-related symptoms, musculoskeletal and others. RSI sufferers were both more likely to feel stressed and have more both musculoskeletal and non musculoskeletal symptoms. Overall RSI sufferers perceived their work environment less favourably than did nonsufferers. These findings bear out the recent literature on stress which suggests that it is the negative appraisal of the situation which determines whether or not stress is experienced and consequently manifest in stress symptoms (Welford, 1973; Meister, 1981). These findings also reinforce the need to view individual vulnerability in the context of the cumulative impact of stress-producing conditions in a person's work (and life).

Despite popular recognition of the role of stress in the development of work related symptoms, there has been little substantive research carried out to statistically explore the nature and relevance of stress to RSI, and stress which is also specific to the nature of keyboard operators' work.

(3) Psychosocial Parameters relating to stress

(A) The Work Environment

The present research clearly identified factors both related to stress and RSI using traditional and new measures. It was shown that work practice factors influenced by authors' attitudes and behaviours are a significant source of stress for keyboard operators who work with authors, and in several cases

such author factors were also related to RSI. In addition, authors' lack of consensus with keyboard operators in terms of their perceptions of work practice and the work environment was related in many instances to the incidence of symptoms in their operators.

(B) Worker Characteristics

However, it was not only author influenced parameters and general work environment issues that related to the occurrence of musculoskeletal problems. Operator determined factors were also related to RSI. A significant and clearly identifiable physiological "stressor" was cigarette smoking. However, as with so many of the factors related to RSI, this could be interpreted as a cause of, or a response to stress. Another very significant physiological variable was exercise, or lack thereof, which related strongly to upper body symptoms, suggesting that regular exercise may reduce the likelihood of upper body problems. In a broader sociological context the lack of exercise may reflect a difficulty common to many working women. Although exercise is widely acknowledged as a general preventative health measure, it is difficult for many people, and women in particular who, after a hard working day still have to care for their children and families, often with little help from their spouses.

Sufferers appeared to be generally less assertive and more likely to abrogate responsibility for unhealthy or nonpreventative work practice (e.g., taking breaks and activity during breaks as mentioned above) than were nonsufferers.

Related to this were psychologically less "positive" self descriptions - tense, worrier, a need to push self, finding it difficult to "say no" and needing to compete with other operators. Obviously the exploratory nature of the questionnaire could not provide indepth psychological profiles, though these findings do suggest the need for more detailed analysis of personal characteristics of operators. However, what these findings suggest is that, in addition to organizational problems and those associated with author lack of awareness there are some factors that operators can do to reduce risk (e.g., taking breaks, resting during breaks, not smoking).

Testing of the overall theoretical model revealed that factors at the two levels were involved - exposure (risk) factors and psychosocial parameters including those relating to author/operator interaction and individual characteristics. Such a finding further reinforces the interpretation of RSI as a multicausal problem that cannot be explained by factors in isolation, but rather only within a wider psychosocial context.

OTHER ISSUES

Non Reporting

An important issue not addressed in existing literature is the reason given by operators for not taking a crucial secondary preventative action of reporting symptoms early. Most guidelines and recommendations indicate the importance of this action to reduce the likelihood of serious and long term damage as well as

to lessen the costs to both the individual and the organization.

What this study did establish is that half those with RSI would not report because they wouldn't want to be labelled as having RSI. This suggests that the stigma attached to (or believed to be attached to) having RSI may be a significant deterrent to preventative action. It appears both socially and personally unacceptable to have RSI.

Site of injury

Another interesting finding, was the incidence of upper body musculoskeletal symptoms (neck, shoulder and upper back). Complaint of upper body symptoms were as frequent as symptoms in the arms, hands and wrists. This finding is more in line with the overseas research which does not have the narrow focus on the peripherals as implied by the Australian publicity and literature on RSI.

CONCLUSIONS

This study has had a specific focus on keyboard workers who work for authors. Obviously the findings that suggest an influence of authors in the incidence of injury is not presented as causal. It is recognized that a significant proportion of those with RSI do not work closely with authors. What has been implied is that a negative work environment, perceived or actual, is related to stress and RSI, and that for keyboard operators who work with authors, aspects of that interaction are significantly associated with injury and stress.

Although keyboard operators' personal characteristics have been shown to influence stress and injury, this study has pointed to the wider contextual factors (psychosocial parameters) which indicate that RSI is not a problem of individuals in isolation. Whilst suggesting individual level intervention, attention must not be deflected from the structural sources of stress because the coping responses people use (or can use) are also affected by organizational and societal constraints.

While emphasising the role of perception, it would be a grave misinterpretation of the present findings to conclude that stress is simply "in the eyes of the beholder". As Otto (1985) emphasises, there is ample evidence to show that stress is widely generated by particular characteristics of work environments, even if there are individual differences in the degree to which people experience stress at any given time and place.

What has been said then is that if RSI is to be thought of as a stress related symptom, it should be considered symptomatic of pathology in the work environment and the failure of that environment to match operators' needs and capacities. The individual's perception thus become very important in identifying such pathology. Intervention strategies then must be directed towards examining the work stress parameters rather than focusing on the failure of persons to tolerate what may be intolerable.

Power

The parameters which have been identified as relating to RSI and or stress are, in a broader context, associated with power. As Karasek (1979) has shown, one of the most crucial predictors of stress and ill-health is the degree of control people have over their work situation and their chances to influence decisions and conditions which affect them. A summary of the literature on work stress by Kahn (1980) pointed out that when occupational groups are ranked roughly in accordance with the degree of control which they afford people, stress producing conditions increase the lower people's position in the hierarchy. Keyboard structures are at the base of this hierarchy with little opportunity for advancement. The less power employees have, the more likely they will be at risk and perceive the work environment parameters negatively; the exposure factors not only produce injury but also produce a great deal of stress as a consequence, creating a feedback loop in the proposed model. House and others (1981) have demonstrated that there is an interactive effect between work related stress and physical

hazards: the greater the measure of occupational stress, the greater the vulnerability to physical hazard: or the greater the exposure to the latter, the greater the vulnerability to other stress factors. The issue of power clearly needs closer examination and more detailed analysis which is beyond the scope of this study.

In conclusion, some important points should be noted. Firstly, some caution must be applied in interpreting causal relationships from the present data. As exposure factors (e.g. deadlines, smoking, resistance to saying no) were measured at the same time as outcome (symptom occurrence), cause or effect can not be clearly distinguished. This is a problem intrinsic to most of the literature on RSI. Secondly, the findings clearly reflect the multicausal nature of RSI at all levels, from individuals - authors and operators, through to organizational features and the distribution of power. There is no sole answer. In addition, what may be a solution for one operator may not be a solution for another (One keyboard operator actually quoted "One man's meat is another man's poison") in regard to many work factors, for example preferred workload. A further qualification about this study is that respondents suffering symptoms were those still in the same work place. Those who were off work or redeployed may constitute a different sample.

This study clearly suggests the need for careful longitudinal investigation. Such studies could follow up the particular symptom groupings to determine which other groups they may later be categorized into, e.g., whether those in the

occasional group are in the early stages of more severe problems or whether they have a more chronic condition. In addition it seems important to determine whether perceptions of the same environment differ as time goes on and/or as symptoms develop.

Issues of a more general and exploratory nature related perception, stress and exposure factors have been introduced in this study. However such issues need to be examined in the context of the literature in such areas as power and organizational psychology, unfortunately beyond the scope of the present study.

RECOMMENDATIONS

These findings suggest several training needs. Clearly authors need to be made aware of each others' perceptions of their work environment. Authors also need to be made aware of their less tangible contribution to operators' work environment. Operators and authors would appear to benefit from general stress management skills that identify the mutual contribution to creating a stressful work environment as well as training in assertiveness, respect, personal responsibility for health and tension reduction techniques. Whilst these interventions are indicated, the importance of the wider social context, including existing control structures within which people have to function must not be ignored or deemphasised. Assertiveness training will not help operators who might lose their jobs if they dare complain. Coping modes are influenced by real, as well as imagined, social constraints and training in more appropriate

individual behaviour is not enough on its own. The need is for changes in the work environment parameters which have been shown to relate to injury, with or without the influence of exposure factors.

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APPENDIX A

KEYBOARD SURVEY

STENO-SECRETARIES AND KEYBOARD OPERATORS

The aim of this voluntary survey is to obtain your opinions about and your perceptions of your work environment and work practice, and some background information about you to further understanding about R.S.I.

Recently a lot of attention has been given to occupational health. Both management and unions agree that there is a need to better understand the effects of work and the work environment on employees so that changes can be made to improve the quality of life in the workplace.

This survey is in five parts:

- 1) a questionnaire about you;
- 2) a questionnaire about your work practice;
- 3) a rating survey of your work environment;
- 4) a questionnaire about your health; and
- 5) an opinion survey about how you rate the factors relating to an increased incidence of RSI.

ALL YOUR ANSWERS WILL BE TREATED IN STRICT CONFIDENCE.

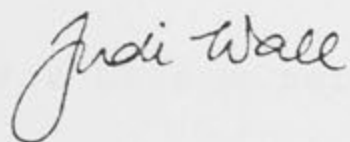
Neither management nor unions will see your completed forms.

YOUR ANSWERS ARE EXTREMELY IMPORTANT. To fully understand the effects of keyboard work, complete and honest answers are needed.

The questionnaire is straightforward and should not take too long to complete.

PLEASE ATTEMPT ALL QUESTIONS. There are no correct answers, and no hidden questions.

Thank you for your cooperation.



Judi Wall,
Department of Psychology,
The Australian National University.

QUESTIONNAIRE FOR STENO-SECRETARIES
AND KEYBOARD OPERATORS

PLEASE ANSWER THE FOLLOWING QUESTIONS AS ACCURATELY AS YOU CAN BY PLACING A TICK (✓) IN THE APPROPRIATE BOX OR BY WRITING IN THE SPACE PROVIDED.

PART 1 : GENERAL BACKGROUND

Office
Use

1. What is your classification/designation

Steno-secretary [11

Word processor 1 12

Typist [13

Other (please specify) _____

2. How long have you been working _____ Years _____ Mths
at your present level?

3. What is your name?

What is the name of the author who gives you the most work?

4. How long have you been working _____ Years _____ Mths
for him/her?

5. How long have you been working on a keyboard? _____ years

6. How old are you: under 20 []

21-25 (12

26-30 [] 3

31-35 []4

36-40 (15

41-45 []6

46- ()7

7. Do you have a second job? Yes []1 No []2

If yes, what type of activities does it involve?

(17)

8. In what country were you born? Country: _____

(18)

9. What is your marital status?

single []1

married/defacto []2

separated []3

divorced []4

widowed []5

(19)

10. Do you do any of the following hobbies at least once a week? If yes, how many hours per week would you spend/week doing them?

	Yes	No	Hours/week	
a) Knitting	[]	[]	_____	(20,21)
b) Video games	[]	[]	_____	(22,23)
c) Tatting/crocheting	[]	[]	_____	(24,25)
d) Sport (e.g basketball, tennis, squash, hockey)	[]	[]	_____	(26,27)
e) Painting/drawing/writing	[]	[]	_____	(28,29)
f) Playing a musical instrument	[]	[]	_____	(30,31)
g) Craft (e.g. spinning, cake decorating)	[]	[]	_____	(32,33)
h) Other (please specify)	[]		_____	(34,35)

11. Are you doing any of the following forms of relaxation at least twice a week?

	Yes	No	
a) Relaxation techniques	[]1	[]2	(36)
b) Yoga/Tai Chi/Meditation	[]1	[]2	(37)
c) Exercising to relax	[]1	[]2	(38)
d) Self hypnosis	[]1	[]2	(39)
e) Other forms of relaxation (please specify)	[]		(40)

Office
Use

2. Do you do regular exercise? Yes []1 No []2

(41)

If yes, what type, how often, and for how long each time?

Type	How often (times/week)	How long (mins)
e.g. running	4 times	30 mins
aerobic dancing	2 times	40 mins
_____	_____	_____
_____	_____	_____
_____	_____	_____

(42,43)
(44,45,46)
(47,48)
(49,50,51)
(52,53)
(54,55,56)

3. Do you drink coffee most days? Yes []1 No []2

(57)

If yes, how many cups would you drink each day?

_____ cups of coffee each day

(58)

4. Do you smoke cigarettes regularly? Yes []1 No []2

(59)

If yes, how many cigarettes do you smoke each day?

_____ cigarettes each day

(60)

5. Do you get at least 6 to 8 hours of restful sleep most nights? Yes []1 No []2

(61)

6. Do you have any children? Yes []1 No []2

(62)

If yes, could you please indicate how many in each age category?

Number of children

Under 6 years old _____

(63)

At Primary school _____

(64)

At High school _____

(65)

Completed school _____

(66)

15. How would you rate the comfort of your working environment in terms of the following:

Office
Use

	Comfortable			Uncomfortable		
EXAMPLE : floor covering	1	2	3	4	5	(67,68,69
a) temperature	1	2	3	4	5	(70,71,72
b) space	1	2	3	4	5	(73,74,75
c) attractiveness of the office	1	2	3	4	5	(76,77,78
d) desk	1	2	3	4	5	(79,80,1
e) chair	1	2	3	4	5	(2,3,4)
f) keyboard	1	2	3	4	5	(5,6,7)
g) air "quality"	1	2	3	4	5	(8,9,10
h) lighting	1	2	3	4	5	(11,12,1

PART 2 : WORK PRACTICE

Office
Use

1. a) What is your "normal" speed/work rate on each type of equipment you currently use and b) "how long" would you maintain that speed/work rate (e.g. 10 mins, 2 hours)?

Equipment	Normal speed	How long	
EXAMPLE : Manual typewriter	80 wpm	6 hours	
Typewriter - electric _____			(1,2,3,4)
electronic _____			(5,6,7,8)
Word processor _____			(9,10,11,12)
Computer Terminal _____			(13,14,15,16)
Other (please specify) _____			(17,18,19,20)

2. Do you prefer a workload which varies (i.e. amount increases and decreases rather than staying constant)?

Yes []1 No []2 (21)

3. Does your workload vary?

Yes []1 Please go to Q.4. (22)

No []2 Please go to Q.5.

4. Could you please indicate what you think is the main reason why the amount of work you do increases.

- | | | |
|---|------|------|
| a) reduced staff | []1 | |
| b) increased conscientiousness | []2 | |
| c) special requests | []3 | |
| d) really enjoying the machine's potential | []4 | (23) |
| e) general increases in workload | []5 | |
| f) authors expect more with the new technology (e.g. word processors) | []6 | |
| g) other (please specify) | [] | |
-

5. How many breaks from keyboard work would you have in a typical day?

- | | | |
|------------------------------|------|------|
| a) none at all | []1 | |
| b) lunch only | []2 | |
| c) tea breaks and lunch only | []3 | (24) |
| d) a 10 min break every hour | []4 | |
| e) continual interruptions | []5 | |
| f) other (please specify) | [] | |

6. On an average day, how often would you do the following during your work breaks? Please circle the number which most closely describes how often you do the following.

	Most breaks		Occas- ionally		Rarely or never	
Move away from desk (and/or "pause gymnastics".)	1	2	3	4	5	(25, 26, 27)
Crochet/knit, etc.	1	2	3	4	5	(28, 29, 30)
Relax, read or chat	1	2	3	4	5	(31, 32, 33)

7. Approximately, what proportion of your time do you spend doing the following in an average week (e.g. 20%, 50%)?

	Proportion of time (%)	
keyboard work	_____	(34, 35, 36)
"domestic" chores or errands for the boss	_____	(37, 38)
dictation	_____	(39, 40)
filing	_____	(41, 42)
writing	_____	(43, 44)
phoning	_____	(45, 46)
any other? (please specify)	_____	
_____	_____	(47, 48, 49)
_____	_____	(50, 51, 52)

8. How often are you asked to work overtime or through lunch?

	More than twice a week	Occasionally	Rarely or Never	
Overtime	[] 1	[] 2	[] 3	(53)
Through Lunch	[] 1	[] 2	[] 3	(54)

9. In terms of the importance of work which you are asked to type, please indicate a) how often you think it is reasonable to be asked to retype it, and b) how often is this exceeded?

Priority	No. Retypes	Exceeded				
		Daily	Weekly	Rarely	Never	
EXAMPLE : Accounts	<u>6</u>	[]	[V]	[]	[]	
Low importance	_____	[] 1	[] 2	[] 3	[] 4	(55,56,57)
Moderately important	_____	[] 1	[] 2	[] 3	[] 4	(58,59,60)
Very important	_____	[] 1	[] 2	[] 3	[] 4	(61,62,63)

10. Do authors routinely request more drafts now that you use more sophisticated equipment?

Yes [] 1 No [] 2 (64)

If yes, what do you think is the main reason why authors make more requests now?

- a) Authors believe you can do more work now [] 1
- b) Authors don't think their drafts out as thoroughly as as they used to [] 2
- c) Misunderstanding of "ease" of making changes [] 3
- d) Other (please specify) []

11. Do you resist saying no to extra requests of work?

Yes []1 No []2

(65)

If yes, is it because of any of these reasons?
Please answer yes OR no.

- | | | | |
|--|------|------|------|
| a) feel guilty if you say no | []1 | []2 | (66) |
| b) feel sorry for author | []1 | []2 | (67) |
| c) don't want to let author down | []1 | []2 | (68) |
| d) like to keep your "good
worker" reputation | []1 | []2 | (69) |
| e) feel anxious that author
wouldn't like you | []1 | []2 | (70) |
| f) would be concerned about the
consequences (e.g. not be
promoted, security of job) | []1 | []2 | (71) |
| g) feel you couldn't make any
requests of the author | []1 | []2 | (72) |
| h) other (please specify) | [] | | (73) |
-
-

12. Would you prefer to have "officially set", regular break times rather than take them when you feel you need them?

Yes []1 No []2

(74)

13. Which one of the following would tend to criticise operators who take rest breaks?

- | | |
|----------------------------|------|
| a) other stenos/operataors | []1 |
| b) supervisors | []2 |
| c) authors | []3 |
| e) no one would criticise | []4 |
| f) other (please specify) | [] |
-

(8)

4. If you don't take breaks when you could, is it usually because of any of these reasons? Please answer by ticking yes OR no.

	Yes	No	
a) you don't want to lose your train of thought or rhythm	[]1	[]2	(75)
b) concerned that you might "lose" work	[]1	[]2	(76)
c) it is more effort to log off and log on	[]1	[]2	(77)
d) you feel you have to protect your keyboard and access to it	[]1	[]2	(78)
e) you enjoy to keep going and don't notice a need to break until after you stop	[]1	[]2	(79)
f) it seems lazy to stop	[]1	[]2	(80)
g) you wouldn't want to break if others working with you were still working	[]1	[]2	(1)
h) there is no point in taking a break because as soon as you stop you are asked to do more work	[]1	[]2	(2)
i) to stop only means more work later	[]1	[]2	(3)
j) people criticise you if you stop	[]1	[]2	(4)
k) can't leave your work position unattended and no relief is available	[]1	[]2	(5)
l) other (please specify)	[]		(6)

Please circle which of the above applies to you the most. (7)

5. Do authors or supervisors sometimes stand/sit next to you while you complete work for them?

Authors Yes []1 No []2 (9)

Supervisors Yes []1 No []2 (10)

Do you mind if they do? Yes []1 No []2 (11)

6. Do you have to meet deadlines?

No []1

Yes, most days []2

Yes, weekly []3

Yes, monthly []4

(12)

7. Taking all things together, how stressful would you say your job has been over the past year (or during the time you have been here if less than a year)?

Not at all stressful []1

A little stressful []2

Moderately stressful []3

Very stressful []4

Extremely stressful []5

(14)

8. If you consider your work over a number of weeks, would you say you felt bored:

Most of the time []1

Some of the time []2

Rarely or never []3

(15)

9. How are you referred to by authors?

as "one of the girls" []1

as "one of the women" []2

by name []3

Other (please specify) []

(16)

10. Do you have control over the planning and carrying out of your work?

Yes []1 No []2

(17)

Would you like to have more, less, or no change in the amount of control you have over the planning carrying out of your work?

more control []1

less control []2

no change []3

(18)

11. Do you feel that you received adequate training for your job, i.e. in your duties and in the use of keyboard and related equipment that you use?

Adequate training

Duties Yes []1 No []2

(19)

Use of equipment Yes []1 No []2

(20)

2. What type of training were you provided with and for how long did this training last on the main keyboard you are presently using?

Type of training	Yes	No	How long (no. days or hours)	
Formal Training	[]	[]	_____	(21)
"on the job"	[]	[]	_____	(22)
read the manual	[]	[]	_____	(23)
other (please specify)				
_____				(24)

3. Who provided the training on the keyboard you are using now?
Please tick one.

Secretarial/typing school	[]	11	
Keyboard Company representative	[]	12	
Computer systems officer	[]	13	
Departmental training officer	[]	14	(25)
Supervisor	[]	15	
Other operator(s)	[]	16	
other (please specify)	[]	17	

4. Have you received work-related training in other areas, apart from the technical aspects of work, e.g.

	Yes	No	
assertiveness training techniques	[]	11	[] 12 (26)
use of ergonomic furniture	[]	11	[] 12 (27)
stress management techniques	[]	11	[] 12 (28)
R.S.I. prevention	[]	11	[] 12 (29)
other (please specify)	[]		(30)

5. Has any new technology been introduced into your work?	Yes []1	No []2	(31)
---	----------	---------	------

If yes,

	Yes	No	
a) were you given adequate time to adjust to the new technology?	[]11	[]12	(32)
b) were you involved in any job redesign when the new technology was introduced	[]11	[]12	(33)

If yes, what areas of involvement did you have?

i) designing procedures for operating new equipment	[]11	[]12	(34)
ii) instructions to users of equipment	[]11	[]12	(35)
iii) planning accommodation and site of new equipment	[]11	[]12	(36)
iv) other (please specify)	[]		

26. Have you received adequate support from technical staff when you have had problems with equipment?	Yes []1	No []2	(37)
--	----------	---------	------

27. Do authors and supervisors encourage you to take breaks?

	Yes	No	
Authors	[]11	[]12	(38)
Supervisors	[]11	[]12	(39)

Do they encourage you to take breaks away from your work station?

Authors	[]11	[]12	(40)
Supervisors	[]11	[]12	(41)

28. Are the components of your workstation easily adjustable?

	Yes	No	Not applicable	
Chair	[]11	[]12	[]13	(42)
Keyboard position	[]11	[]12	[]13	(43)
Desk height	[]11	[]12	[]13	(44)
Screen	[]11	[]12	[]13	(45)

Office
Use

29. In general, how would you describe your main author's personal style in your working relationship with him/her? Please circle the number which best describes him/her?

Supportive	1	2	3	4	5	Unsupportive	(46,47,48)
Considerate	1	2	3	4	5	Inconsiderate	(49,50,51)
Undemanding	1	2	3	4	5	Demanding	(52,53,54)
Relaxed	1	2	3	4	5	Authoritative	(55,56,57)

30. Is the author who gives you the most work male or female?

Male	[]1	Female	[]2	(58)
------	------	--------	------	------

PART 4 : HEALTH

THE NEXT QUESTIONS ARE CONCERNED WITH YOUR WORK AND YOUR HEALTH. PLEASE INDICATE ANY PROBLEMS YOU MAY HAVE - EVEN IF THEY ONLY LAST A SHORT TIME (SAY AN HOUR) OR OCCUR AFTER WORK.

Office
Use

1. While you have been doing keying work, have you ever had any of the following problems in any part of your body:

pain, aching, stiffness, cramp, swelling, soreness, weakness, tingling or numbness?

Yes ☐ Please go to Q.2

No ☐ Please go to Q.13

2. Have you had any of these problems in any of the following areas:

Your upper back, shoulders, neck or upper arms?

Yes ☐1 No ☐2

(2)

Your fingers, hands, wrists, forearms or elbows?

Yes ☐1 No ☐2

(3)

3. Please list and describe these problems in the columns below (an example is given first to assist you.)

EXAMPLE:

PROBLEM NO.	AREA AFFECTED	RIGHT, LEFT OR BOTH SIDES	TYPE OF PROBLEM	HOW OFTEN IT OCCURS	HOW LONG SINCE FIRST NOTICED
1	back	right	stiff	everyday	6 months
2	wrists	both	swell	once a month	4 years

YOUR ANSWERS HERE:

PROBLEM NO.	AREA AFFECTED	RIGHT, LEFT OR BOTH SIDES	TYPE OF PROBLEM	HOW OFTEN IT OCCURS	HOW LONG SINCE FIRST NOTICED
1					
2					
3					
4					

Office
Use

4. Please place a tick in the square if, in the past year, you have reported any of these problems to your supervisor at work.

Problems with:

Reported to Supervisor

Fingers, hands, wrists
forearms or elbows

Yes []1 No []2

(24)

Upper arms, shoulders, neck
or back (above waist)

Yes []1 No []2

(25)

5. Please place a tick in the square if, in the past year, you have had to visit the doctor about any of the problems with:

Seen Doctor

Fingers, hands, wrists
forearms or elbows

Yes []1 No []2

(26)

Upper arms, shoulders, neck
or back (above waist)

Yes []1 No []2

(27)

IF NO VISITS TO THE DOCTOR FOR THESE PROBLEMS PLEASE GO TO Q.9.

6. What diagnosis did the doctor give you?

Diagnosis: _____

(28)

7. Do you have confidence that this diagnosis is correct?

Yes []1 No []2

(29)

If no, what do you think it might be?

(30)

8. In the past year, if the doctor give you time off work for any of these problems please indicate the number of days given.

_____ Days

(31,32)

9. If, in the past year, you required time off because of any of these problems, but such time off was not ordered by a doctor, please indicate the number of days taken.

_____ Days

(33,34)

10. If you have had any of the above problems (listed in Q.1)

a) what type of equipment were you using the first time you noticed these problems?

Model/Brand

Typewriter _____ (35)

Word Processor _____ (36)

Computer Terminal _____ (37)

Other (please specify) _____ (38)

b) was there any change in your equipment or furniture prior to developing such problems?

Yes []1 No []2 (39)

c) did you change your working pattern or increase your work rate prior to becoming aware of your problems?

Yes []1 No []2 (40)

If yes, over what period of time was this change maintained?

Yes No If yes, for how long?

worked faster [] [] _____ days/weeks/mths (41)

worked overtime [] [] _____ days/weeks/mths (42)

didn't take breaks [] [] _____ days/weeks/mths (43)

other (please specify)

_____ (44)

_____ days/weeks/mths (45)

d) did the problems follow any long absence from work? (e.g. sick leave, recreation leave, maternity, etc.)?

Yes []1 No []2 (46)

e) were you recently promoted or performing higher duties just prior to your problems occurring?

Yes []1 No []2 (47)

11. Have you received any long term relief of your symptoms?

Yes [] 1

No [] 2

(48)

If yes, what do you think gave you this relief?

PROBLEMS LIKE THOSE IN THE PREVIOUS QUESTION (Q 1-5) CAN INTERFERE WITH OTHER ACTIVITIES.

12. Please indicate whether or not any of the following activities have been affected for you by ticking yes or no:

	Yes	No	
Preparation of food	[] 1	[] 2	(50)
Housework	[] 1	[] 2	(51)
Dressing	[] 1	[] 2	(52)
Caring for children	[] 1	[] 2	(53)
Gardening	[] 1	[] 2	(54)
Shopping	[] 1	[] 2	(55)
Driving	[] 1	[] 2	(56)
Leisure activities	[] 1	[] 2	(57)
(please specify) _____			
Other activities	[] 1	[] 2	(58)
(please specify) _____			

13. Please place a tick in the square if, in the past year, any of your work mates have reported any of these problems (as listed in Q.1) to the supervisor.

Problems with:

	Reported to Supervisor		
	Yes [] 1	No [] 2	
Fingers, hands, wrists forearms or elbows			(59)
Upper arms, shoulders, neck or back (above waist)	Yes [] 1	No [] 2	(60)

14. In the past year, have any of your work mates, other friends or members of your family been given time off work for any of these problems (ordered by a doctor)?

	Given time off work by Dr.		
	Yes [] 1	No [] 2	
workmates			(61)
friends	Yes [] 1	No [] 2	(62)
family	Yes [] 1	No [] 2	(63)

AGAIN, IN THE FOLLOWING QUESTION, PLEASE INDICATE ANY PROBLEMS YOU MAY HAVE, EVEN IF THEY ONLY LAST A SHORT TIME OR OCCUR AFTER WORK.

15. Has your work caused any of the following conditions:

	Yes	No	Office Use
Headaches	[]1	[]2	(64)
Eye strain, sore or tired eyes	[]1	[]2	(65)
Problems seeing colour	[]1	[]2	(66)
Blurred vision, difficulty in reading	[]1	[]2	(67)
Loss of appetite	[]1	[]2	(68)
Loss of concentration	[]1	[]2	(69)
A skin rash	[]1	[]2	(70)
Dizziness	[]1	[]2	(71)
Any other problems? (please specify)	[]		(72)

16. Would you be hesitant to report any work related symptoms because of any of the following reasons?:

	Yes	No	
nobody would listen	[]1	[]2	(73)
can't believe I would get injured from work	[]1	[]2	(74)
skeptical reactions from others	[]1	[]2	(75)
for economic reasons, can't afford to be put off work	[]1	[]2	(76)
wouldn't want to be labelled as having RSI	[]1	[]2	(77)
other (please specify)			

17. Are you taking any medication? Yes []1 No []2

If yes, could you please indicate what you are taking?

The Pill []1

Antihistamines []2

Painkillers []3

Other (please specify) []

(79)

18. Have you suffered any non work injury to any of these parts of your body (e.g. broken bones, whiplash, etc.)

Back Yes []1 No []2

(80)

Arms Yes []1 No []2

(1)

Hands Yes []1 No []2

(2)

Shoulders Yes []1 No []2

(3)

19. Do you have a history of arthritis? Yes []1 No []2

(4)

20. Have you suffered any major crisis in the last year (e.g. bereavement, money, legal, relationship, family)

Yes []1 No []2

(5)

21. Do you feel that, during the past year, you have been affected by stress that had nothing to do with work?

Yes []1 No []2

(6)

If yes, how stressful have things been for you?

A little stressful []1

Moderately stressful []2

Very stressful []3

Extremely stressful []4

(7)

22. How well do you feel you really cope with stress?

Cope very well []1

Cope quite well []2

Keep up outward appearances but don't cope very well inwardly

[]3

(8)

Just don't seem to cope most of the time

[]4

23. Please circle the number which most closely describes you at work on the following continuums:

extroverted	1	2	3	4	5	introverted	(9,10,11)
relaxed	1	2	3	4	5	tense	(12,13,14)
worrier	1	2	3	4	5	non worrier	(15,16,17)
shy	1	2	3	4	5	confident	(18,19,20)
perfectionist	1	2	3	4	5	easy going	(21,22,23)
dominant	1	2	3	4	5	submissive	(24,25,26)
"workaholic"	1	2	3	4	5	leisurely	(27,28,29)

Office
Use

PART 3 : WORK ENVIRONMENT

BELOW ARE STATEMENTS ABOUT THE WORK ENVIRONMENT AND WORK PRACTICE

If a statement is definitely true for you, circle 1.
 If it is mostly true for you, circle 2.
 If you don't know whether it is true or false, circle 3.
 If it is mostly false for you, circle 4.
 If it is definitely false for you, circle 5.

	Definitely true		Definitely false			Office Use
EXAMPLE : I always get to work on time	1	2	3	4	5	
1. My work is challenging, critical and skillful	1	2	3	4	5	(1,2,3)
2. I feel committed to my job and take pride in my work	1	2	3	4	5	(4,5,6)
3. There is a lot of group support at work	1	2	3	4	5	(7,8,9)
4. I feel comfortable with any new technology introduced into the office	1	2	3	4	5	(10,11,12)
5. I am usually consulted about and can influence departmental decisions affecting me	1	2	3	4	5	(13,14,15)
6. I am always given feedback about the work I do	1	2	3	4	5	(16,17,18)
7. Authors have realistic expectations of me and the work I do	1	2	3	4	5	(19,20,21)
8. "Urgent" work given to me by authors is <u>always</u> really essential	1	2	3	4	5	(22,23,24)
9. I often have to push myself to work harder and faster	1	2	3	4	5	(25,26,27)
10. I regularly miss breaks (rest and/or meal breaks)	1	2	3	4	5	(28,29,30)
11. My work requires intense attention and concentration	1	2	3	4	5	(31,32,33)
12. There is enough time to take rest breaks	1	2	3	4	5	(34,35,36)
13. I find it easy to say no when I want to	1	2	3	4	5	(37,38,39)
14. I am concerned about the security of my job	1	2	3	4	5	(40,41,42)
15. It is reasonable to be asked to type memos and file notes	1	2	3	4	5	(43,44,45)
16. I am happy to type the same work an unlimited number of times	1	2	3	4	5	(46,47,48)
17. I never seem to get on top of work	1	2	3	4	5	(49,50,51)
18. I feel competent in performing the tasks associated with my job	1	2	3	4	5	(52,53,54)
19. I feel I have to work as fast as, or faster than other steno/operators	1	2	3	4	5	(55,56,57)
20. I feel more stressed typing important documents	1	2	3	4	5	(58,59,60)

PART 5 : FACTORS RELATED TO RSI

BELOW IS A LIST OF FACTORS WHICH PEOPLE THINK HAVE
LEAD TO AN INCREASED INCIDENCE OF RSI.

IN GERNERAL, HOW DO YOU RATE THE IMPORTANCE OF THESE FACTORS IN
INCREASING THE INCIDENCE OF RSI? PLEASE CIRCLE THE NUMBER WHICH
MOST NEARLY REPRESENTS HOW IMPORTANT YOU THINK THIS FACTOR IS.

	Very Important			Not Important		Office Use
	1	2	3	4	5	
EXAMPLE : Virus					5	
1. Equipment and Furniture						
a) chairs	1	2	3	4	5	(1,2,3)
b) desks	1	2	3	4	5	(4,5,6)
c) keyboard	1	2	3	4	5	(7,8,9)
2. Office						
a) temperature	1	2	3	4	5	(10,11,12)
b) lack of space	1	2	3	4	5	(13,14,15)
c) attractiveness of office	1	2	3	4	5	(16,17,18)
d) lighting	1	2	3	4	5	(19,20,21)
e) air "quality"	1	2	3	4	5	(22,23,24)
3. Operator's						
a) Personality	1	2	3	4	5	(25,26,27)
b) "work ethic"	1	2	3	4	5	(28,29,30)
4. Other activities						
a) 2nd job	1	2	3	4	5	(31,32,33)
b) hobbies	1	2	3	4	5	(34,35,36)
c) sport	1	2	3	4	5	(37,38,39)
5. Workload						
a) quantity	1	2	3	4	5	(40,41,42)
b) deadlines	1	2	3	4	5	(43,44,45)
c) lack of breaks	1	2	3	4	5	(46,47,48)
6. Lack of control by operators in planning and doing work	1	2	3	4	5	(49,50,51)
7. Nature of work						
a) repetitive	1	2	3	4	5	(52,53,54)
b) boring	1	2	3	4	5	(55,56,57)
c) concentration required	1	2	3	4	5	(58,59,60)
d) speed of keying	1	2	3	4	5	(61,62,63)
8. Malingering	1	2	3	4	5	(64,65,66)
9. Technology						
a) fear of it	1	2	3	4	5	(67,68,69)
b) operator lack of understanding	1	2	3	4	5	(70,71,72)
c) "addiction" to it's potential	1	2	3	4	5	(73,74,75)

	Very Important			Not Important		Office Use
10. New label for old aches and pains	1	2	3	4	5	(76,77,78)
11. Lack of social support						
a) at work	1	2	3	4	5	(79,80,1)
b) at home	1	2	3	4	5	(2,3,4)
12. Peer pressure	1	2	3	4	5	(5,6,7)
13. Lack of understanding by authors of the nature of the work (unrealistic expectations)	1	2	3	4	5	(8,9,10)
14. Physical fitness of operator	1	2	3	4	5	(11,12,13)
15. Delay in reporting symptoms resulting in a worsening of condition	1	2	3	4	5	(14,15,16)
16. Over-use of painkillers, masking symptoms and thereby making them worse	1	2	3	4	5	(17,18,19)
17. Inadequate training						
a) for task	1	2	3	4	5	(20,21,22)
b) in use of equipment	1	2	3	4	5	(23,24,25)
18. Personal stresses of operators	1	2	3	4	5	(26,27,28)
19. Trying too hard						
a) working too fast	1	2	3	4	5	(29,30,31)
b) too long	1	2	3	4	5	(32,33,34)
c) too forcefully	1	2	3	4	5	(35,36,37)
20. Medical history of operator						
a) arthritis	1	2	3	4	5	(38,39,40)
b) illness	1	2	3	4	5	(41,42,43)
c) injury (whiplash, broken limbs etc.)	1	2	3	4	5	(44,45,46)
21. Consumption patterns of operators (smoking, diet, alcohol)	1	2	3	4	5	(47,48,49)
22. Union activity and education	1	2	3	4	5	(50,51,52)
23. Workers' Compensation laws	1	2	3	4	5	(53,54,55)
24. General attitude of authors and supervisors towards operators	1	2	3	4	5	(56,57,58)

YOU HAVE NOW FINISHED THE QUESTIONNAIRE

THANK YOU FOR YOUR PARTICIPATION

If you have any comments you would like to make, especially about issues you think weren't properly covered in this questionnaire, please write them below. Again, all comments will be treated as strictly confidential.

When you have finished, please place the questionnaire in the envelope.

Thank you.

ADDITIONAL COMMENTS:

APPENDIX B

KEYBOARD SURVEY

AUTHORS

The aim of this voluntary survey is to obtain your opinions about and your perceptions of the work environment and work practice as it relates to the steno-secretary or keyboard operator who does the most work for you.

Recently a lot of attention has been given to occupational health. Both management and unions agree that there is a need to better understand the effects of work and the work environment on employees so that changes can be made to improve the quality of life in the workplace.

This survey is in four parts:

- 1) a brief questionnaire about you;
- 2) a questionnaire about your perception of work practice, and in particular as it relates to the steno/keyboard operator who does the most work for you;
- 3) a rating survey of your impression of the work environment of the steno-secretaries/keyboard operators who do(es) the most work for you, and
- 4) an opinion survey about how you rate the factors relating to the increased incidence of RSI.

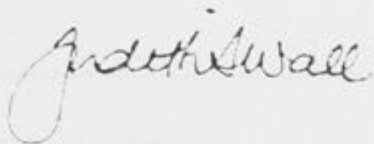
ALL YOUR ANSWERS WILL BE TREATED IN STRICT CONFIDENCE.
Neither management nor unions will see your completed forms.

YOUR ANSWERS ARE EXTREMELY IMPORTANT.

The questionnaire is straightforward and should not take too long to complete.

PLEASE ATTEMPT ALL QUESTIONS. There are no correct answers, and no hidden questions.

Thank you for your cooperation.



Judi Wall,
The Australian National University.

QUESTIONNAIRE FOR AUTHORS

STENO-SECRETARIES AND KEYBOARD OPERATORS HAVE BEEN ASKED TO NOMINATE THE PEOPLE WHO GENERATE MATERIAL THAT THEY TYPE. YOU ARE ONE OF THESE PEOPLE. THIS SURVEY IS SEEKING YOUR PERCEPTIONS AND OPINIONS ABOUT WORK PRACTICE AND THE WORK ENVIRONMENT AS IT RELATES TO THE STENO-SECRETARY OR KEYBOARD OPERATOR WHO DOES THE MOST WORK FOR YOU.

SHE HAS BEEN ASKED SIMILAR QUESTIONS ABOUT HER PERCEPTION OF HER WORK PRACTICE AND WORK ENVIRONMENT. IT IS THEREFORE REQUESTED THAT YOU PUT YOUR NAME IN THE SPACE PROVIDED SO YOUR RESPONSES CAN BE CORRELATED WITH HER ANSWERS.

ONLY YOU AND THE RESEARCHER WILL SEE THIS FORM. AN ENVELOPE IS PROVIDED FOR YOU TO ENSURE YOUR ANSWERS REMAIN CONFIDENTIAL. AS YOU WILL BE ABLE TO APPRECIATE, YOUR HONEST ANSWER IS NEEDED.

PLEASE ANSWER THE FOLLOWING QUESTIONS AS ACCURATELY AS YOU CAN BY PLACING A TICK [✓] IN THE APPROPRIATE BOX OR BY WRITING IN THE SPACE PROVIDED.

PART 1 : GENERAL BACKGROUND

1. What is your classification/designation?

Office
Use

(1)

2. What is the classification/designation of the keyboard operator who does the most work for you?

Steno-secretary [] 1

Word processor [] 2

Typist [] 3

(2)

Other (please specify) _____

THE FOLLOWING QUESTIONS MENTIONING "YOUR STENO/OPERATOR" REFER TO THIS PERSON.

3. What is your steno/operator's name?

What is your name?

(3,4,5)

4. How long has she been working with you?

_____ Years _____ Months

(6,7)

(8,9)

5. How long have you been working at your present level?

_____ Years _____ Months

(10,11)

(12,13)

6. Are you doing any of the following forms of relaxation at least twice a week? Please tick yes or no.

	Yes	No	
a) Relaxation techniques	[]1	[]2	(14)
b) Yoga/Tai Chi/Meditation	[]1	[]2	(15)
c) Self hypnosis	[]1	[]2	(16)
d) Exercising to relax	[]1	[]2	(17)
e) Other forms of relaxation (please specify)	[]1		(18)

7. Approximately, how many pages would you get processed/typed on an average day? _____ (19,20)

8. Have you attended any of the following?

stress management course	Yes []1	No []2	(21)
management training course	Yes []1	No []2	(22)

PART 2 : WORK PRACTICE

Office
Use

1. Do you think your steno/operator prefers a work load which varies (i.e. increases and decreases rather than staying constant)?

Yes []1 No []2 Don't know []3

(23)

2. How many breaks from keyboard work do you think your stenos/operator has in a typical day?

- a) none at all []1
b) lunch only []2
c) tea breaks and lunch only []3
d) a 10 min break every hour []4
e) continual interruptions []5
f) don't know []6
g) other (please specify) []

(24)

3. Approximately what proportion of your steno's/operator's time do you think is spent doing the following in an average day? (e.g. 20%, 50%, 80%)

Proportion of time (%)

keyboard work	_____	(25, 26, 27)
"domestic" chores or errands for you	_____	(28, 29)
dictation	_____	(30, 31)
filing	_____	(32, 33)
writing	_____	(34, 35)
phoning	_____	(36, 37)
other (please specify)	_____	(38, 39)

4. How often do you ask your steno/operator to work overtime or through lunch?

More than Occasionally Rarely
twice a week or Never

Overtime	[]1	[]2	[]3	(40)
Through Lunch	[]1	[]2	[]3	(41)

5. Do you use a keyboard at home or at work? Yes []1 No []2 (42)
If yes, how often?

daily []1

weekly []2 (43)

monthly []3

6. In terms of the importance of work which you request to be typed/processed, please indicate: a) how often you think it is reasonable to ask for it to be retyped, and b) how often you would tend to exceed this?

Priority	No. Retypes reasonable	Exceeded				
		Daily	Weekly	Rarely	Never	
EXAMPLE :	<u>6</u>	[]	[✓]	[]	[]	
Low importance	<u> </u>	[]1	[]2	[]3	[]4	(44,45,46)
Moderately important	<u> </u>	[]1	[]2	[]3	[]4	(47,48,49)
Very important	<u> </u>	[]1	[]2	[]3	[]4	(50,51,52)

7. Do you routinely request more drafts now that more sophisticated equipment is available?

Yes [] No [] (53)

If yes, what do you think is the main reason why you request more drafts now?

I probably don't think my drafts out as thoroughly as I used to []1
operators can do more work now []2 (54)
changes are so much easier to make []3
other (please specify) []

8. The following questions are about your steno/operator's work breaks. In general:

	Yes	No	Don't know	
a) do you think her breaks should be "officially set", rather than at her own discretion?	[]1	[]2	[]3	(55)
b) do you encourage her to take breaks	[]1	[]2		(56)
c) do you encourage her to take breaks away from her work positions	[]1	[]2		(57)

9. Do you set deadlines?

No [] 11

Yes, most days [] 12

Yes, weekly [] 13

Yes, monthly [] 14

(58)

10. Do you sometimes stand/sit next to your steno/operator while she completes work for you?

Yes [] 11 No [] 12

(59)

Do you think she minds this practice?

Yes [] 11 No [] 12 Don't know [] 13

(60)

11. Taking all things together, how stressful would you say work is for your steno/operator over the past year (or during the time she has been working for you)?

Not at all stressful [] 11

Moderately stressful [] 12

Extremely stressful [] 13

Don't know [] 14

(61)

12. Considering your steno/operator's work over a number of weeks, would you say her work is boring:

Most of the time [] 11

Some of the time [] 12

Rarely or never [] 13

Don't know [] 14

(62)

13. If a dispute occurs between you and a steno/operator, do you think a supervisor should intervene?

Yes [] 11 No [] 12

(63)

14. Do you think your steno/operator should have more, less or no change of control over the planning and carrying out of her work?

More control [] 11

Less control [] 12

No change [] 13

Don't know [] 14

(64)

Office
Use

15. In general, how would you describe your personal style in your working relationship with your steno/operator? Please circle the number which best describes you.

Supportive	1	2	3	4	5	Unsupportive	(65,66,67)
Considerate	1	2	3	4	5	Inconsiderate	(68,69,70)
Undemanding	1	2	3	4	5	Demanding	(71,72,73)
Relaxed	1	2	3	4	5	Authoritative	(74,75,76)

16. Do you think operators receive adequate training in their duties and in the use of their equipment?

	Yes	No	Don't know	
Duties	[] 1	[] 2	[] 3	(77)
Use of equipment	[] 1	[] 2	[] 3	(78)

PART 3 : WORK ENVIRONMENT SCALE

BELOW ARE STATEMENTS REFERING TO THE WORK ENVIRONMENT AND WORK PRACTICE OF THE STENO-SECRETARY OR OTHER KEYBOARD OPERATOR WHO DOES THE MOST WORK FOR YOU.

- If a statement is definitely true for you, please circle 1.
 If it is mostly true for you, please circle 2.
 If you don't know whether it is true or false, please circle 3.
 If it is mostly false for you, please circle 4.
 If it is definitely false for you, please circle 5.

	Definitely true		Definitely false		Office Use
EXAMPLE : Stenos/operators type fast	1	2	3	4	5
1. The work my steno/operator does is challenging, critical and skillful	1	2	3	4	5 (1,2,3)
2. She appears committed to her job and takes pride in her work	1	2	3	4	5 (4,5,6)
3. There is a lot of group support at work	1	2	3	4	5 (7,8,9)
4. She seems comfortable with any new technology introduced into the office	1	2	3	4	5 (10,11,12)
5. My steno/operator is usually consulted about and can influence departmental decisions affecting her	1	2	3	4	5 (13,14,15)
6. She is given feedback about the work she does for me	1	2	3	4	5 (16,17,18)
7. I have realistic expectations of my steno/operator and the work she does	1	2	3	4	5 (19,20,21)
8. "Urgent" work I give to my steno/operator is <u>always</u> really essential	1	2	3	4	5 (22,23,24)
9. My steno/operator often appears to have push herself to work harder and faster	1	2	3	4	5 (25,26,27)
10. She has autonomy in planning and doing her work	1	2	3	4	5 (28,29,30)
11. The work I give her requires intense attention and concentration	1	2	3	4	5 (31,32,33)
12. There is enough time for my steno/operator to take rest breaks	1	2	3	4	5 (34,35,36)
13. She always says no to extra work when she wants to	1	2	3	4	5 (37,38,39)
14. It is reasonable to ask that memos and file notes be typed	1	2	3	4	5 (40,41,42)
15. My steno/operator appears happy to type the same article an unlimited number of times	1	2	3	4	5 (43,44,45)
16. She never seems to get on top of work	1	2	3	4	5 (46,47,48)
17. It is more stressful for my steno/operator to type important documents	1	2	3	4	5 (49,50,51)

APPENDIX C

KEYBOARD SURVEY

SUPERVISORS OF STENO-SECRETARIES/KEYBOARD OPERATORS

The aim of this voluntary survey is to obtain your opinions and perceptions about the work environment and work practice of the steno-secretaries and/or other keyboard operators who you supervise.

Recently a lot of attention has been given to occupational health. Both management and unions agree that there is a need to better understand the effects of work and the work environment on employees so that changes can be made to improve the quality of life in the workplace.

This survey is in four parts:

- 1) a brief questionnaire about you,
- 2) a questionnaire about your perception of work practice, and in particular as it relates to the steno/keyboard operators who you supervise,
- 3) a rating survey of your impression of the work environment of the steno-secretaries/keyboard operators who you supervise, and
- 4) an opinion survey about how you rate the factors relating to the increased incidence of RSI. If you have already completed a steno-secretary/keyboard operator survey, you do not need to attempt this final part.

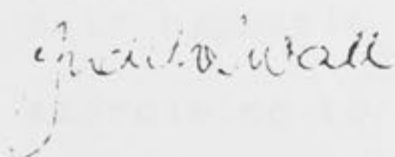
ALL YOUR ANSWERS WILL BE STRICTLY CONFIDENTIAL. Neither management nor unions will see your completed forms.

YOURS ANSWERS ARE EXTREMELY IMPORTANT. To fully understand the effects of keyboard work, complete and honest answers are needed.

The questionnaire is straightforward and should not take too long to complete.

PLEASE ATTEMPT ALL QUESTIONS. There are no correct answers, and no hidden questions.

Thank you for your cooperation.



Judi Wall,
The Australian National University.

SUPERVISORS OF
STENO-SECRETARIES AND KEYBOARD OPERATORS

PART 1 : GENERAL BACKGROUND

PLEASE ANSWER THE FOLLOWING QUESTIONS AS ACCURATELY AS YOU CAN BY PLACING A TICK [☒] IN THE APPROPRIATE BOX OR BY WRITING IN THE SPACE PROVIDED.

1. What is your classification/designation?

(1)

2. How many steno-secretaries and/or other keyboard operators do you supervise?

Steno-secretaries _____ (number)

(2)

Keyboard operators _____ (number)

(3)

3. In the past year (12 months), have any of these operators been diagnosed as having RSI or related symptoms requiring them to take leave or altered duties

Yes [☐] 1 No [☐] 2

(4)

If yes, how many have been diagnosed as having RSI or related problems necessitating time off work or altered duties?

No. with RSI or related symptoms

Steno-secretaries _____

(5)

Keyboard operators _____

(6)

4. How long have you been working in your present position?

_____ Years _____ Months

(7,8)
(9,10)

5. Are you doing any of the following forms of relaxation at least twice a week? Please tick yes or no.

Yes No

relaxation techniques [☐] 1 [☐] 2

(11)

Yoga/Tai Chi/Meditation [☐] 1 [☐] 2

(12)

self hypnosis [☐] 1 [☐] 2

(13)

exercising to relax [☐] 1 [☐] 2

(14)

other forms of relaxation [☐]
(please specify)

(15)

Office
Use

6. Do you feel you have received adequate training in the use of keyboards and related equipment used by those who you supervise?

Yes []1

No []2

(16)

7. Have you attended any of the following?

stress management course

Yes []1

No []2

(17)

management training course

Yes []1

No []2

(18)

supervisor training course

Yes []1

No []2

(19)

PART 2 : WORK PRACTICE

Office
Use

1. In general, do you think the working pattern of stenos/
operators changes just prior to them developing RSI?

Yes []1 No []2

(20)

If yes, please indicate which of the following
you think is the most common change precipitating RSI.

- a) worked faster []1
- b) worked overtime []2
- c) didn't take breaks []3
- d) don't know []4
- e) Other (please specify) []

(21)

-
2. Which of the following do you think is the major cause of
general increases in the amount of work steno/operators do?

- a) reduced staff []1
- b) increased conscientiousness []2
- c) special work requests []3
- d) really enjoying the machine's
potential []4
- e) general increase in workload []5
- f) don't know []6
- g) authors expect more of the
new technology []7
- h) other (please specify) []8

(22)

3. How many breaks from keyboard work would stenos/operators have in a typical day?

- a) none at all [] 11
b) lunch only [] 12
c) tea breaks and lunch only [] 13
d) a 10 min break every hour [] 14
e) continual interruptions [] 15
f) don't know []
g) other (please specify) []

(23)

4. Do you think stenos/operators prefer varied workloads rather than a constant amount to do?

varied workload Yes [] 11 No [] 12

(24)

5. How often do you ask stenos/operators to work overtime or through lunch?

	More than twice a week	Occasionally	Rarely or Never
Overtime	[]	[]	[]
Through Lunch	[]	[]	[]

(25)

(26)

6. In terms of the importance of work which stenos/operators type/process, please indicate: a) how often you think it is reasonable to ask for it to be retyped, and b) how often this would be exceeded.

Priority	No. retypes reasonable	Exceeded			
		Daily	Weekly	Rarely	Never
EXAMPLE :	<u>6</u>	[]	[✓]	[]	[]
Low importance	<u> </u>	[] 11	[] 12	[] 13	[] 14
Moderately important	<u> </u>	[] 11	[] 12	[] 13	[] 14
Very important	<u> </u>	[] 11	[] 12	[] 13	[] 14

(27,28,29)

(30,31,32)

(34,35,36)

7. Do authors routinely request more drafts now that more sophisticated equipment is available?

(37)

Yes []1 No []2

If yes, why do you think authors make more changes?
Please answer yes OR no.

	Yes	No	
a) authors think that stenos/operators can do much more work now	[]1	[]2	(38)
b) authors don't think their drafts out as thoroughly as they used to	[]1	[]2	(39)
c) changes are so much easier to make	[]1	[]2	(40)
d) Other (please specify)	[]		(41)

11. Do stenos/operators usually say yes to authors' and your requests to do extra work?

(42)

Yes []1 No []2

If yes, is it because of any of these reasons?
Please answer by ticking yes OR no.

Stenos/operators usually say yes because they:

	Yes	No	
a) feel sorry for you or the author	[]1	[]2	(43)
b) feel guilty if they say no	[]1	[]2	(44)
c) don't want to let you or authors down	[]1	[]2	(45)
d) like to keep their "good worker" reputation	[]1	[]2	(46)
e) are anxious that you or authors wouldn't like them if they said no	[]1	[]2	(47)
f) are concerned about the consequences if they said no (e.g. not promoted, security of job)	[]1	[]2	(48)
g) feel they couldn't make any requests of you or authors	[]1	[]2	(49)
h) other (please specify)	[]		(50)

12. Whose needs do you put first, second and third.
Please rate 1, 2 and 3.

stenos/operators _____

(51)

self _____

(52)

authors _____

(53)

13. The following questions are about steno's/operator's
work breaks. Please answer yes OR no.

Yes No

In general :

a) do you think their breaks should
be "officically set", rather than
at their own discretion

[] 1 [] 2

(54)

b) do you encourage them to take
rest breaks

[] 1 [] 2

(55)

c) do you encourage them to take
breaks away from their work
positions

[] 1 [] 2

(56)

14. Do the stenos/operators who you
supervise tend not to take rest breaks?

Yes [] 1 No [] 2

(57)

If stenos/operators don't take breaks when they could, do you
think it is because of any of these reasons? Please answer
by ticking yes OR no, if you think stenos/operators:

Yes No

a) don't want to lose their train of thought
or rhythm of work

[] 1 [] 2

(58)

b) don't want to lose their train of thinking

[] 1 [] 2

(59)

c) feel it is more effort to log off
and on again

[] 1 [] 2

(60)

d) have to protect keyboard and access
to it

[] 1 [] 2

(61)

e) want to keep going

[] 1 [] 2

(62)

f) think it is lazy to stop

[] 1 [] 2

(63)

g) can't leave their work unattended and
no relief is available

[] 1 [] 2

(64)

h) other (please specify)

[]

(65)

15. Do you and authors regularly set deadlines?

	Daily	Weekly	Monthly	Never
You	[11	[12	[13	[14
Author	[11	[12	[13	[14

(66)

(67)

16. Do you ever stand/sit next to stenos/operators while they complete work?

a) often [11
b) sometimes [12
c) never [13

(68)

Do you think they mind if you do so?

Yes [11 No [12 Don't know [13

(69)

17. Taking all things together, how stressful would you say work has been for the stenos/operators over the past year (or during the time you have been working in this position)?

Not at all stressful [11
A little stressful [12
Moderately stressful [13
Very stressful [14
Extremely stressful [15
Don't know [16

(70)

18. Considering your stenos/operators' work over a number of weeks would you say they felt bored:

Most of the time [11
Some of the time [12
Rarely or never [13
Don't know [14

(71)

19. How would you rate the comfort of your stenos/operators' working environment in terms of:

	Comfortable			Uncomfortable		
a) temperature	1	2	3	4	5	(72,73,74)
b) amount of space	1	2	3	4	5	(75,76,77)
c) attractiveness of the office	1	2	3	4	5	(78,79,80)
d) desks	1	2	3	4	5	(1,2,3)
e) chairs	1	2	3	4	5	(4,5,6)
f) keyboard	1	2	3	4	5	(7,8,9)
g) air 'quality'	1	2	3	4	5	(10,11,12)
h) lighting	1	2	3	4	5	(13,14,15)

20. Are you willing to identify and assist with problems in the operation of keyboard and related equipment?

Yes []1 No []2 (16)

21. Are you able to identify and assist with problems in the operation of keyboard and related equipment?

Yes []1 No []2 (17)

22. If a dispute occurred between a steno/operator and an author, would you be prepared to intervene?

Yes []1 No []2 (18)

23. How do you refer to stenos/operators?

as "the girls" []1

as "the women" []2

by name []3

other (please specify) []4

(19)

24. Do the stenos/operators who you supervise have control over the planning and carrying out of their work?

(20)

Yes []1 No []2

Do you think they would like more, less, or no change in the amount of control they have over the planning and carrying out of their work?

more control []1

less control []2

no change []3

don't know []4

25. Do you think stenos/operators receive adequate training for their duties and in the use of equipment?

Adequate Training

Duties

Yes []1 No []2

(22)

Equipment

Yes []1 No []2

(23)

26. When new technology has been introduced into stenos/operators' work, have they been:

a) given adequate time to adjust to the new technology?

Yes []1 No []2

(24)

b) involved in any job redesign when new technology when the new technology was introduced?

Yes []1 No []2

(25)

If yes, what areas of involvement did they have?

i) designing procedures for operating new equipment

Yes []1 No []2

(26)

ii) instructions to users of equipment

Yes []1 No []2

(27)

iii) planning accommodation and site of new equipment

Yes []1 No []2

27. Do you think stenos/operators receive adequate support from technical staff when they have problems with equipment?

Yes []1 No []2

(28)

PART 3 : WORK ENVIRONMENT

BELOW ARE STATEMENTS REFERING TO THE WORK ENVIRONMENT AND WORK PRACTICE OF THE STENO-SECRETARIES AND/OR OTHER KEYBOARD OPERATORS WHO YOU SUPERVISE.

- If a statement is definitely true for you, please circle 1.
 If it is mostly true for you, please circle 2.
 If you don't know whether it is true or false, please circle 3.
 If it is mostly false for you, please circle 4.
 If it is definitely false for you, please circle 5.

	Definitely true		Definitely false			Office Use
EXAMPLE : Stenos/operators type fast	1	2	3	4	5	
1. Stenos'/operators' work is challenging, critical and skillful	1	2	3	4	5	(1,2,3)
2. Stenos/operators are committed to their job and take pride in their work	1	2	3	4	5	(4,5,6)
3. There is a lot of group support at work	1	2	3	4	5	(7,8,9)
4. Stenos/operators appear comfortable with any new technology introduced into the office	1	2	3	4	5	(10,11,12)
5. Stenos/operators are given feedback about the work they do from me	1	2	3	4	5	(13,14,15)
6. "Urgent" work given to stenos/operators is always <u>really</u> essential	1	2	3	4	5	(16,17,18)
7. Overall, a steno's/operator's job is stressful and pressured	1	2	3	4	5	(19,20,21)
8. Stenos/operators often appear to have to push themselves to work harder and faster	1	2	3	4	5	(22,23,24)
9. Steno's/operator's work is sufficiently varied	1	2	3	4	5	(25,26,27)
10. Stenos'/operators' work requires intense attention and concentration	1	2	3	4	5	(28,29,30)
11. There is enough time for stenos/operators to take rest breaks	1	2	3	4	5	(31,32,33)
12. Stenos/operators are probably concerned about the security of their job	1	2	3	4	5	(34,35,36)
13. It is reasonable to ask that memos and file notes be typed	1	2	3	4	5	(37,38,39)
14. Stenos/operators appear happy to type the same article an unlimited number of times	1	2	3	4	5	(40,41,42)
15. Stenos/operators never seem to get on top of work	1	2	3	4	5	(43,44,45)
16. It is more stressful for stenos/operators to type important documents	1	2	3	4	5	(46,47,48)

YOU HAVE NOW FINISHED THE QUESTIONNAIRE

THANK YOU FOR YOUR PARTICIPATION

If you have any comments you would like to make, especially about issues you think weren't properly covered in this questionnaire, please write them below. Again, all comments will be treated as strictly confidential.

When you have finished, please place the questionnaire in the envelope.

Thank you.

ADDITIONAL COMMENTS: